



NAVAL POSTGRADUATE SCHOOL

MONTEREY, CALIFORNIA

THESIS

**THE EFFECT OF GRADUATE EDUCATION TIMING
ON THE RETENTION OF SURFACE WARFARE
OFFICERS**

by

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March 2016

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**THE EFFECT OF GRADUATE EDUCATION TIMING ON THE RETENTION
OF SURFACE WARFARE OFFICERS**

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ABSTRACT

This thesis examines the effect of the timing of graduate education attainment on retention of officers within the Surface Warfare community. Navy Surface Warfare Officers (SWOs) commissioned between fiscal years 1999 and 2003 are assigned one of five classifications: no graduate degree, or master's earned prior to service, before five years of service, between five and 10 years of service, or after 10 years of service. Differential bivariate probit analysis is used to determine the effect of the timing of graduate education attainment on retention to the tenth, eleventh, and twelfth year of service, as well as promotion to O-4. The findings show that SWO Department Heads who earn a master's degree at any point within their careers are more likely to retain. Officers who earned a graduate degree before commissioning or prior to five years of commissioned service are no more likely to retain, as compared with SWOs with no graduate education, while those who obtained graduate education after five years of service are significantly more likely to retain. In addition, the findings show that department heads earning a master's degree at any point within their careers are more likely to promote to O-4, compared with those who had not earned a master's degree. Graduate education shows to have the potential of a strategic investment in human capital that can be used by the Navy as a retention tool. Future work can address the potential selection bias associated with higher retention of those with graduate education attained after five years of commissioned service by SWOs who might be already committed to a Navy career.

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LIST OF ACRONYMS AND ABBREVIATIONS

DH	Department Head
DO	Division Officer
SWO	Surface Warfare Officer
JO	Junior Officer
ROI	Return on Investment
SURFOR	Surface Forces
QOL	Quality of Life
DOD	Department of Defense
DON	Department of the Navy
IGEP	Immediate Graduate Education Program
VGEP	Voluntary Graduate Education Program
24/12	Instructor Program
ROTC	Reserve Officer Training Corps
OCS	Officer Candidate School
JPME	Joint Professional Military Education
NPS	Naval Postgraduate School
GEV	Graduate Education Voucher
GE+T	Graduate Education plus Teaching
NOOCS	Manual of Navy Officer Manpower and Personnel Classifications
LEAD	Leadership Education and Development
USNA	United States Naval Academy
NWC	Naval War College
NDU	National Defense University
JMILINTEL	Joint Military Intelligence University
RJCSRB	Revised Junior Critical Skills Retention Bonus
BUPERS	Bureau of Personnel
METOC	Meteorological and Oceanographic Community
URL	Unrestricted Line
RL	Restricted Line
EDO	Engineering Duty Officer

BDOC	Basic Division Officer Course
ADOC	Advanced Division Officer Course
DMDC	Defense Manpower Datacenter
TAO	Tactical Action Officer
AQD	Additional Qualification Designation
YCS	Years of Continuous Service
YOS	Years of Service
YG	Year Group
FY	Fiscal Year
WTI	Weapon's Tactics Instructor

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I. INTRODUCTION

The retention of highly skilled, high-quality officers will always be a priority mission of the Navy, and the Surface Warfare Officer (SWO) community. Competition for these performers is inherently difficult and requires diverse and compelling incentives that transcend monetary gain, such as career-enhancing opportunities, education, and quality of life.

Funded graduate education has become a retention tool of the Navy for officers post initial service obligation, as suggested by previous studies such as Bowman and Mehay (1999). The Navy offers several fully or partially-funded graduate education opportunities. To guarantee a marginal return on investment (ROI), an additional obligation service period is required. Ultimately, these programs are an investment of human capital providing for and improving skill levels and the quality of Navy manpower. The SWO community capitalizes upon these graduate programs by using them as retention incentives for Junior Officers (JO), and profiting from the skills acquired during their education.

The shore period after the initial sea tour(s) is a more relaxed duty environment that serves SWO JOs as a reprieve during which they could earn a graduate degree. Within the SWO community, a graduate degree is perceived as a significant career milestone and increases the likelihood of advancement to pay grade O-4 and beyond. Previous studies into the promotion of naval officers support this assumption. Abunaz and Tobrun (2012) find that SWOs who had graduate degrees were likely to promote faster to O-4. Bowman and Mehay (1999) find that officers holding graduate degrees are more likely to promote to O-4 than those who did not. Graduate education is encouraged to take place early. The SWO career has an operational tempo, and fewer opportunities that make obtaining graduate education later on more difficult. Early attainment provides a greater ROI for the Navy and increases the likelihood of a utilization tour (RAND, 2010). Joint Professional Military Education (JPME), a significant career milestone, is often completed concurrently with the graduate education, either in residence, or through Distance Learning (DL).

Based upon information from the National Center for Education Statistics, the largest age group of students enrolled in graduate education is between 25 and 29 years of age. A JO's shore tour begins on average at age 26, placing them within this age group. Suitable timing along the SWO community career track allows SWO JOs to maintain parity with their peers, while benefiting the Navy with additional obligated service and greater skillsets.

A. PURPOSE

The purpose of this thesis is to examine the effect the period of graduate education attainment has on retention of SWO JOs in the Navy and the SWO community. From the SWO Community Manager's Pinpoints, it is necessary to retain 275 JOs from each Year Group (YG) in order to adequately fulfill Department Head (DH) manpower requirements (PERS-41, 2015). For the past several years, the SWO community has enjoyed a period where enough JOs remained within the community to satisfy the DH quota. This has not always been the case, particularly when the labor market was strong and operational tempo was high.

SWO JOs may enjoy better opportunities of employment outside of the military and grow weary from increased work load. Providing graduate education is a retention incentive for SWO JOs; however, even if a SWO JO who earns a graduate degree decides to stay in the Navy, he or she does not always remain in the SWO community. Proposed changes to the current career track offering flexible career timing options may hinder or benefit a JO's pursuit for higher education and affect an individual's likelihood of retention. For community career planning it is important to understand what factors are likely to affect JO retention in the community to create an optimal system that promotes war fighting knowledge and ability, improves and diversifies skill sets, while creating a desirable quality of life.

This study seeks to answer these primary research questions:

1. What effect does graduate education have in the SWO community with respect to retention and promotion?

2. Does the period when a SWO earns a graduate degree affect the decision to remain in the Navy and the SWO community?
3. What foreseeable impact does altering the traditional SWO career track have on SWO graduate opportunities and retention?

Ultimately, after regression analysis of available data, it was found that graduate education between the fifth and tenth year, and after the tenth year, of service increased the likelihood of retention to the twelfth year by nearly 20% among DHs. Of those DHs who promoted to O-4, 71% held a master's degree and this mass proliferation suggests an unspoken requirement. DHs were more likely to promote to O-4 if they had earned a master's degree. Alterations to the legacy career track that impedes the golden period between five and 10 years could lose the positive retention effect from graduate education. However, alterations to the career track which promotes graduate education and utilization earlier in a SWO's career not only captures the positive effect of retention, but increases ROI to the Navy through earlier utilization.

B. SCOPE

The study focuses on the retention of SWOs from initial Division Officer (DO) tours to separation. It will take a quantitative multivariate analysis approach to investigate the retention SWO officers with graduate education.

The results of this study are likely to benefit the Navy by contributing to existing literature studying the effect of graduate education on retention and performance. It will benefit the SWO community by providing a statistical analysis of a SWO preference for graduate education and a greater understanding of how graduate education and the period of attainment affect retention.

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II. BACKGROUND

This chapter provides a background description on the SWO community's recent trends on retention, the JO perception of the community, the community composition by pay grade, career milestones and priorities, as well as traditional and future career tracks. Additionally, a description of Navy graduate opportunities available to the SWO community and is also included. The content in this background chapter informs the data selection and analytical approach of this thesis.

A. THE SWO COMMUNITY

The SWO community experiences a noticeable decline in personnel after the end of initial obligated service. As an example, of the original population of the dataset, only 36% will remain to become DHs. This attrition rate is not isolated and has occurred outside of the period of data collected. YGs 08, 07, and 06 have community attrition rates of 47%, 43%, and 45%, respectively (PERS-41, 2015). This marked decline reflects post-obligation separation and lateral transfer within the Navy to other communities.

The SWO community faces the same objectives as all other Navy communities: to retain enough quality personnel to meet mission requirements. Per the Community Manager, the SWO community requires 275 JOs from each YG in order to fulfill DH billeting, or approximately 32% of the average YG (PERS-41, 2015). The SWO community has met this mission since YG 08 (PERS-41, 2015). While having a high attrition rate, the SWO community also has one of the largest accession volumes of new officers among Navy communities, only the Aviation community is larger (FY2016 FALL 15 OPA, 2015). It is thanks in part to this high volume of accessions that the community is able to provide the necessary number of DHs.

The large matriculation number is a result of manpower planning for the required DH quotas. There are instances where the community sees an increase in total number from years of continuous service (YCS) 0 and YCS 1 and 2 due to re-designation from other communities. The community is very JO heavy in order to meet manpower requirements at higher levels.

Absolute retention is not possible, nor is it the goal, but understanding the factors that affect attrition is important in order to make better decisions for the SWO community and retain the appropriate talent. The decision of SWOs to leave the Navy may be due to the lack of opportunity to improve themselves and remain marketable in the private sector. The skillsets acquired within the service may not have civilian equivalents. If we assume achieving a graduate degree in one's field of study or profession is critical to remaining marketable, an individual should be interested in pursuing graduate level education. If JOs value the opportunity to earn a graduate degree during their shore tour, in the same manner as they do for starting a family, graduate education can be perceived as a quality of life (QOL) matter. A community that offers enhanced graduate education opportunities is also offering an improved QOL.

A common criticism of funded graduate education is that it is of questionable benefit for the Navy, and that the individual earning the degree will be more likely to leave the service after becoming more marketable within the private sector. Prevailing literature refutes this, and supports graduate education as retention tool for naval officers to 10 YCS (Mehay & Bowman, 1999). However, data on the ROI for the Navy in the current iteration of the utilization process is lacking and the entire system could be improved (RAND, 2010). This criticism is partially addressed by the obligatory service periods imposed by Department of Defense (DOD) graduate education initiatives, offsetting some potential value lost by separation of the service member (DON, 2015). Pigeonholing an individual into service-specific trades and talents that only benefit the Navy might hurt retention. This exclusionary practice will only hurt the individual's attitude toward the Navy and affect their decision to remain. If members are only educated in the "Navy way" of thought, there is a risk of losing diversity in idea and opinion and creating a force unequal to its private sector counterpart academically.

The SWO community has a reputation for being inhospitable to JOs; the phrase "Eat their Own" reflects a well-known stereotype of the SWO community within the Navy. The initial obligatory service period can either be a period of amazing opportunity or consternation and disappointment. These personal experiences are circumstantial and arguably no two JOs share the same experience. No matter if it is positive or negative, the

obligatory service period can result in significant lag in educational parity with civilian peers. The opportunity to earn graduate education may be a defining factor for JOs in retaining parity. Earning a graduate degree with an extended obligation to the Navy benefits the individual and the Navy. While graduate education opportunities as a whole might be an incentive to remain within the Navy, community career planning that facilitates opportunities to earn a master's degree encourages a JO to remain within the SWO community.

With career planning in mind, earning a graduate degree is not just an educational incentive but a quality of life incentive for SWO JOs. This quality-of-life factor in earning a graduate degree can be described in similar fashion to that of raising a family within the military. Sea duty is arduous, and the inter-period between DO and DH tours is seen as a reprieve; it is often the time chosen by many SWO JOs to start families. The shore period not only facilitates an easier pregnancy for SWO JO families, it provides a significantly better environment in which to earn a graduate degree. Often times JOs will choose to do both, as the lull period provides the opportunity. Choosing to get a graduate degree will increase the overall quality of life for JOs should they separate from the Navy at any point.

B. JOINT PROFESSIONAL MILITARY EDUCATION (JPME)

A significant career milestone for a naval officer is the completion of the JPME mandated by the Goldwater-Nichols Act of 1986. As of 2010, within the SWO community completion of JPME Phase I is required in order to assume O-5 command. JPME is comprised of three stages, JPME Phase I, Phase II, and Capstone. Completion of the preceding level of JPME is required for subsequent qualification (PERS-41, n.d.).

JPME Phase I can be completed, and is highly recommended to be done, in residence at certain DOD education institutions with the alternative being completion via distance learning with the Naval War College (NWC) or other intermediate service colleges. The course of study includes courses in Joint Military Operations, Strategy and War, and Theater Security Decision Making. These courses are academically rigorous and robust requiring substantial effort of the student. JPME Phase II and the Capstone

must be completed in residence at the NWC or other National Defense Universities (PERS-41, n.d.)

C. OFFICER SUBSPECIALTY AND UTILIZATION

The most recent instruction governing Navy graduate education, OPNAVINST 1520.42A, establishes that further education is a strategic investment to further the Naval Service. Navy-funded graduate education is established to improve both hard and soft skills that are beneficial to the Navy (DON, 2009). Most curricula funded by the Navy, either at NPS or other, award a subspecialty code indicating the possession of specific skills and abilities, which sets an officer apart from his or her peers. Receiving graduate education is a common way that a subspecialty code is awarded although extended periods of experience within a field may also award a code (DON, 2009). A code is awarded after completion of requisite education but the code holder is not considered to be a fully qualified subspecialist until they have served a utilization tour in their area (DON, 2009).

To improve the ROI of graduate education the Navy seeks to assign officers to utilization tours during their careers based upon subspecialty codes. The assignment of individuals to subspecialty tours is the responsibility of their individual communities and as such some communities are more effective at applying subspecialty designated officers. In a recent RAND study on Navy graduate education programs, it was determined that at large the Navy is not receiving the optimal ROI from subspecialty coded officers, stating that the current trend of one utilization tour during a subspecialty coded officer's career is inadequate (RAND, 2010).

D. IMMEDIATE GRADUATE EDUCATION PROGRAM

The Immediate Graduate Education Program (IGEP), also known as the Bowman Scholarship, provides the opportunity to a small number of Midshipmen from the United States Naval Academy (USNA) who have selected into the submarine or nuclear surface communities to immediately begin their graduate education upon completion of their undergraduate degree and prior to their initial fleet tour. The selectees will attend NPS for an accelerated 12-month graduate program in a technical degree field that has been

approved by the submarine officer community manager. Participants are expected to maintain a 3.0 grade point average while in attendance. Due to the accelerated time frame and rigor of this program, participants are unable to complete JPME Phase 1 (USNA, 2014).

E. VOLUNTARY GRADUATE EDUCATION PROGRAM (VGEP)

The intention of VGEP is to allow the opportunity for 20 exceptionally driven Midshipmen per class of the USNA to earn a graduate degree and qualify for a subspecialty code early in an individual's career. Graduate courses are intended be completed concurrently with the undergraduate course load during the final semester of the senior year. The graduate program will be completed with a local university approved by the USNA. The remaining graduate courses are to be completed in the months immediately after graduation and finished by the following January. The program is intended to be completed within a single calendar year, after which participants will report to their respective community training pipelines. Due to the added period after graduation from the USNA, an additional period of seven months is added to the initial period of obligated service. Participation in VGEP is wholly voluntary, and a member may discontinue the program at any time (USNA, 2008)

F. SWO GRADUATE EDUCATION OPPORTUNITIES

Earning a graduate degree is a function of ability, opportunity, and desire. It is always an option for JOs to fund their education themselves; however, to promote graduate education, the Navy and the Surface community have made numerous opportunities and initiatives available. These programs are not free, as any active duty officers participating in Navy-funded graduate education programs incur an obligatory service period of no less than three years from the completion of their education (DON, 2007).

The SWO community is committed to providing fully funded graduate education to SWO JOs through popular Navy options namely, the Naval Postgraduate School (NPS), USNA Leadership Education and Development (LEAD) and Graduate Education Plus Teaching (GE+T) Programs, Graduate Education Voucher (GEV), and the Instructor

Program (24/12) (PERS-41, n.d.). Participation in the majority of these programs requires accepting the Revised Junior Critical Skills Retention Bonus (RJCSRB) and committing to serving no fewer than two DH sea tours (DON, 2012). For a SWO JO, RJCSRB realistically makes the additional commitment five years as opposed to the three mandated by the Navy (RAND, 2010). This additional stipulation prevents the SWO community from losing significant talent and leverages SWO graduate education billets as an incentive for JOs to remain within the community and become DHs.

The Naval War College (NWC) exists as the Navy's primary source for graduate level professional military education and provides an additional option to earn a graduate degree from a Navy institution (DON, 2015). The NWC provides education primarily to senior officers in the O-4 paygrade and above. There are no dedicated SWO billets for an officer junior than O-4, but there are extraneous circumstances that have permitted O-3s attend. The NWC is not a serious option for a JO seeking a graduate degree prior to DH school (PERS-41, n.d.).

Other programs exist in the Navy to aid graduate education that are not necessarily supported by the SWO community with dedicated billets. The Olmstead Scholarship and Pol-Mil Master Program provide selected individuals opportunities to study overseas or at prestigious domestic institutions such as Harvard, Stanford, or Georgetown (PERS-41, n.d.). Tuition Assistance (TA) may be used to pay for graduate education of the JO's choice and unlike fully funded Navy programs, TA comes with an additional obligation of 2 years, vice 3, and does not require RJCSRB, leaving a JO the freedom to laterally transfer from the community if desired (DON, 2008). TA is defined by the Navy as partially funded education.

Below, the SWO graduate education options are presented in greater detail.

1. Naval Postgraduate School

Designated as the Navy's primary source of graduate education, NPS is a Navy-funded graduate level institution in Monterey, California, providing graduate-level degrees with a defense focus (DON, 2009). The NPS curriculum is dictated by the Navy, with some degrees offered having no civilian equivalents (DON, 2009). Degrees awarded

at NPS award a subspecialty code, which graduate degrees from other institutions may not guarantee. Many NPS curricula have integrated JPME Phase I into their schedule, allowing a JO to finish this career milestone early.

The NPS SWO curriculum does not include billets in every program offered, which might preclude a JO from entertaining it as an option outright (PERS-41, n.d.). Most billets in the NPS SWO curriculum carry with them the obligation to sign RJCSRB before receiving orders. As such, in-residence programs at NPS has become a favored option for JOs who have made the decision to retain within the community early and wish to have a period of dedicated study, earn a graduate degree, and experience a less strenuous life compared to shipboard life. Residence billets at NPS vary in length, ranging from 18 to 27 months. Assignment to NPS is competitive, and it is only awarded, via selection board, to individuals who have been academically approved by NPS (PERS-41, n.d.). If in-residence programs are not an option for an individual, the SWO community holds billets in the NPS Executive Master of Business Administration (EMBA) and Master of Systems Analysis (MSA) distance learning programs, which could be completed while serving their shore tour (PERS-41, n.d.).

Unlike some Navy communities, the SWO community has little-to-no stigma regarding attending NPS. The SWO community of NPS is almost entirely composed of JOs, and attending NPS is often seen as a beneficial career decision, allowing JOs to complete a graduate degree and JPME Phase I early so as not to pose a potential hindrance later on in their careers. The close community of JOs affords an opportunity to develop network with many of their peers whom they will be working with later as DHs and beyond, creating career lasting relationships. An additional benefit that is hard to quantify is the exposure to peers and senior officers of other communities and other military services. This exposure gives greater insight into the plight and situation of other members of the DOD and creates an overall more rounded officer.

2. Graduate Education Voucher and 24/12

The GEV is a Navy-wide program, which awards \$20,000 a year for a maximum of two years toward an officer's graduate education (DON, 2012). The voucher may be

used at any number of educational institutions, provided that the program meets the requirements of an approved subspecialty code per NPS curriculum and is approved by the Navy Education and Training Command (NETC). Forty-three SWO billets are available per fiscal year and are delineated further by the subspecialty awarded (DON, 2012).

The SWO Instructor Program, otherwise known as 24/12, is an initiative to incentivize a JO to take orders with shore commands, such as the Afloat Training Group, Surface Warfare Officer School, Engineering Assessment Teams, Naval Reserve Officer Training Corps (ROTC) Units, and Nuke Power School, whose mission is to promote training and instruction (PERS-41, n.d.). In 24/12, the first 24 months would be spent with the shore command, fulfilling duties to the command and pursuing graduate education off duty (PERS-41, n.d.). The following 12 months would be light duty to support graduate education through a program of their choice, using the GEV. Programs must meet the requirements set forth by the GEV; individuals are not allowed permanent change of station (PCS) from their preceding 24 month shore tour. A JO who opts for the 24/12 program must sign RJCSRB (PERS-41, n.d.).

3. USNA LEAD and GE+T

The USNA LEAD program is a fully funded graduate education program, which awards a graduate degree in Leadership, Education and Development from a Washington D.C.–Baltimore metropolitan university (DON, 2008). The program consists of a 12-month period wherein the exclusive duty is graduate education, followed by a 24-month period where participants serves as a company officer at USNA, training midshipmen and practicing leadership principals. The SWO community has between five and seven billets per year for the USNA LEAD program (DON, 2012).

The GE+T program is similar to LEAD with the exception that, in place of a company officer tour, the participant would serve as an instructor of various subjects. A 12-month period is allowed to complete a graduate degree from a local Baltimore area university or NPS, followed by a 24-month instructor tour. Billet availability is intermittent (DON, 2012).

Both of these programs carry an additional Navy-mandated service period, as well as signature of RJCSRB. In addition to earning a graduate degree, participants will be enrolled in JPME Phase I during their 24-month follow-on tour as a company officer or instructor (DON, 2006).

4. Tuition Assistance

TA is not a fully funded graduate education program, but can offset some of the monetary costs. TA is a tool that JOs can use to earn a graduate degree during the shore tour without any billeted assistance allotting time to complete. Using TA obligates JOs to an additional 2 years of service, which may be served in conjunction with any other obligation. However, it does not confine them to the SWO community as if they had signed RJCSRB (DON, 2008). Completion of a master's degree and JPME Phase I is the responsibility of the JOs, and cannot interfere with shore tour duties and responsibilities (PERS-41, n.d.).

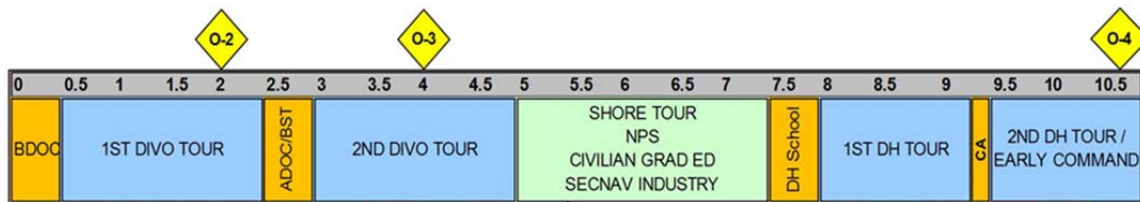
G. SWO CAREER PROGRESSION AND CAREER TRACK OPTIONS

In the SWO community, the first four years consist of two DO tours afloat. During the first tour, the JO will qualify as a SWO during the first tour, or be forced to leave the community if that individual fails to qualify. The second DO tour is spent in a more advanced billet, either on their first ship in a “fleet up” role, or on a new ship, where the objective is for the JOs to earn more advanced qualifications in order to be competitive later in their careers. Between YCS 4 and 5, a JO would proceed to a shore billet, either to serve while waiting to report to DH school, transition into another Navy community, or leave the active Navy service.

The amount of time spent on trade-specific SWO training varies, depending upon the initial year of commission service and the role the officer performed. During the period over which the data was collected for this thesis (over the course of their initial DO tours) SWO JOs received an intro 6-month course to prepare them for their shipboard duties and approximately 4–6 months of additional trade schooling. The current career track is similar in the timing of trade-specific schooling; however, due to cost of instruction, the number of months received during the first two tours has been reduced to

an average of 7 months. This period includes a Basic Division Officer Course (BDOC), where newly commissioned JOs will be taught basic skills of a DO, and Advanced Division Officer Course (ADOC), which takes place between DO tours to refresh necessary skills. A representation of the current career track through end of the second DH tour is provided in Figure 1.

Figure 1. Traditional SWO career track



From PERS-41 community career briefing, fall 2015.

In the current iteration, if an individual wishes to earn a graduate degree, the schooling is expected to be completed during the shore tour period. This period offers specific billets to participate in Navy-funded graduate education programs or greater flexibility to earn a graduate degree in the individual's personal time. JPME Phase I is generally conducted during this period either in residence or through DL.

While the current process is not broken, it could always be better. Initiatives led by the Surface Type Commander (SURFOR) seek to get away from the conveyor belt approach of career path and empower JOs with greater flexibility and timing control of their career (PERS-41, n.d.). The goal is that these multi-track career options will attract more talented, dedicated JOs to remain within the community to become DHs. These paths are based around multiple timing options and billets that will overall bolster the ability of the SWO community. Currently, there are four tracks: the aforementioned traditional, Accelerated Warfighter, Enhanced Readiness track, and the Accelerated Skillset Development career tracks (PERS-41, 2015).

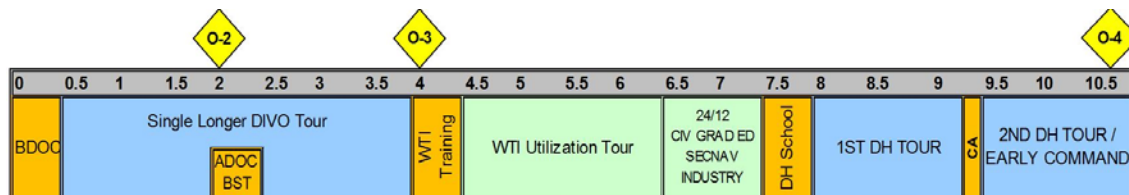
1. Accelerated Warfighter

The Accelerated Warfighter Development track differs from the Traditional track in that, in lieu of a traditional shore tour following their second DO tour, JOs would report to one of three sites for training in a specific warfare area to become a Weapons Tactics Instructor (WTI). These WTIs would receive intense training in their specific areas which they would take back to the fleet as instructors in fleet concentration areas in various capacities. The goal is that these WTIs will bolster war-fighting level of knowledge (PERS-41, 2015).

The WTI training and utilization periods will be intense, and the level of effort expected of these individuals almost guarantees preclusion from graduate education. Of the four tracks outlined, the Accelerated Warfighter offers the least amount of time within which a JO could earn a graduate degree. A one-year window exists between utilization and DH school (PERS-41, 2015). This window is almost certainly subject to change by community requirements, and options exist to forgo this period and accelerate arrival to DH school (PERS-41 n.d.).

SURFOR seeks to have 110 individuals per YG attend the requisite training to become WTIs. SURFOR has also stated that favorable language would be added to selection boards to reflect the importance of WTIs (PERS-41, n.d.). JOs who opt to become WTIs may very well be trading graduate education for increased position among peers in the community (PERS-41, 2015). A visual representation of the Accelerated Warfare Track showing an extended single DO tour is provided in Figure 2. The Accelerated Warfighter is equally compatible with the traditional 2 DO tour arrangement (PERS-41, 2015).

Figure 2. Accelerated Warfighter career track

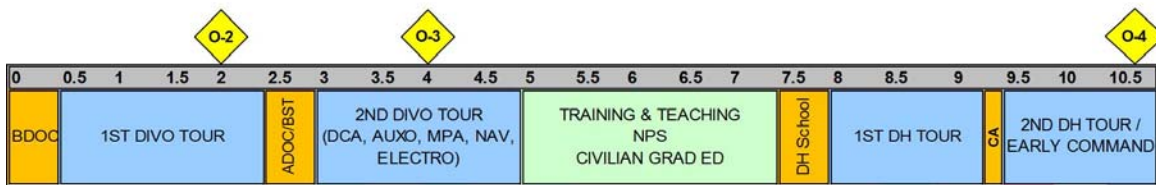


From PERS-41 community career briefing, fall 2015.

2. Enhanced Readiness

The Enhanced Readiness Track is geared toward officers who sustain shipboard readiness within the engineering and navigation departments of the ship (PERS-41, 2015). These officers will proceed to follow-on tours instructing at the Naval Academy, BDOC and ADOC, Navy ROTC Units, and various other training commands. It is expected that these JOs would take the opportunity at these billets to hone their skillsets. This track is designed to afford officers an expanded opportunity to participate in elite, national-level, advanced postgraduate education programs like the Olmstead Scholar program as well as enhanced compatibility with the GEV (PERS-41, 2015). A visual representation of the track and is compatible with both single and double DO tour arrangements is provided in Figure 3.

Figure 3. Shipboard Readiness career track



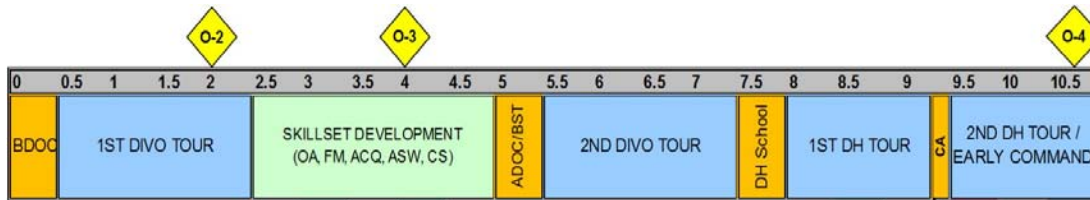
From PERS-41 Community Career Briefing, fall 2015.

3. Accelerated Skillset Development

The Accelerated Skillset Development track offers a different timing scheme. This path will offer tours at NPS to earn a graduate degree and subspecialty code in between the initial DO tours. Traditionally, NPS is only offered after the completion of two DO tours but in this scheme, JOs would complete their first DO tour and attend NPS, attending ADOC afterward and prior to the second DO tour. The period in between completing the second DO tour and DH school is designed to be minimal. This track hopes to foster skillsets early to be utilized later to benefit the community. The early completion of graduate education owes itself to being a more cost effective investment and more beneficial to the Navy as suggested by previous literature (Cheek, 2012; RAND, 2010). A visual representation of the Accelerated Skillset Development track is

provided in Figure 4. Unlike the other career track option, the Accelerated Skillset Development track is not compatible with a single longer DO tour.

Figure 4. Accelerated Skillset Development career track



From PERS-41 community career briefing, fall 2015.

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III. LITERATURE REVIEW

This chapter provides a review of the relevant and recent studies that examined the effect of graduate education within the Navy. While some studies focused on the retention and promotion effect of graduate education, others studies reviewed attempted to assess the ROI of providing fully funded graduate education. This review offers a framework to guide this thesis's analysis and approach.

A. EVALUATING THE NAVY'S FULLY FUNDED GRADUATE EDUCATION PROGRAM (RAND, 2010)

In 2010, the National Defense Research Institute, commonly known as RAND, was asked by the Department of the Navy to assess quantitatively and qualitatively the ROI of their fully funded graduate education programs (RAND, 2010). With a substantial investment on each naval officer, it was of significant interest to understand the merits of the graduate education programs. The study included assessments of DOD and Navy graduate education policy, a comparison of the Navy's graduate education program to programs in other services, and a thorough review of human and social capital investment literature, both civilian and military. Particularly, focus was on the effects of graduate education and utilization rates within the SWO and Meteorological and Oceanographic (METOC) communities.

The study found that significant changes with the billeting and assignment system of officers who receive graduate education are needed in order to increase the ROI of the Navy (RAND, 2010). The study also recommended that the overall policy of awarding graduate education should be evaluated and placed in line with the Navy's goals (RAND, 2010). The study found that the current policy of one utilization tour for a 20-year career is inadequate for the Navy to break even on their investment (RAND, 2010). Significant differences were observed in the utilization between Restricted Line (RL) and Unrestricted Line (URL) groups, with the METOC community being the observation group for RL and the SWO community for URL. The SWO community's career

framework relegates many of the utilization tour billets to the O-4 or O-5 level, where their absence from operational duty is more costly than it would be at lower pay grades.

In relation to this thesis, the 2010 assessment of the funded graduate education programs by RAND highlights many of the challenges associated with graduate education in the Navy, and the SWO community in particular. Additionally, the assessment provided ample literature review of human and social capital investment, in the civilian and military worlds. The study highlighted the importance of hard and soft skills gained from the graduate education process, skills that are important to the investment in human capital that the Navy and SWO community make. While this thesis examines the effect of timing of graduate education attainment on SWOs retention, the human and social capital investment factors are important to assessing far reaching implications of career track modification apart from SWO JO retention.

B. RETENTION EFFECTS OF IMMEDIATE GRADUATE EDUCATION IN THE NUCLEAR COMMUNITY (LT SIDNEY W. CHEEK, 2012)

In 2012, LT Sidney Cheek conducted a study on the effect of early-timed graduate education on retention within the Navy's nuclear community, as part of her NPS master's thesis work. The thesis looked at the Nuclear community, composed of nuclear qualified officers from the SWO and Submarine communities. LT Cheek's study sought to determine whether receiving graduate education earlier in an officer's career would have an effect on retention, and on the likelihood for promoting to O-4 and beyond. In addition, her study also attempted to provide a monetary figure for the cost differential to the Navy for an officer receiving graduate education earlier versus later in their career.

Data used for the Cheek (2012) study was obtained from Navy Personnel N-42 using the Officer Distribution Information System and covered a period from 1983 to 1992. The working dataset comprised of 4,979 data points. Due to restriction on females in the nuclear community during the period of observation the dataset is entirely composed of male officers. Using logistic multivariate regression models, her study refuted the perception within the nuclear community that officers who received their graduate education early in their career were more prone to leave the Navy before

reaching O-5. She found that an individual who earned a graduate degree prior to their five-year mark and who promoted to LCDR was more likely to stay within the nuclear community to O-5 as opposed to an officer who earned a graduate degree after their five-year mark (Cheek, 2012). She estimated that the Navy saves \$50,000 to \$70,000 per year on an individual when earning a graduate degree prior to their five-year mark as opposed to earning a degree later in their careers (Cheek, 2012).

This thesis will build upon LT Cheek's work by investigating the importance of timing of graduate education on the retention and performance of officers. The findings can be used in the re-examination of community career policy.

C. THE EFFECT OF ADVANCED EDUCATION ON THE PROMOTION AND RETENTION OF SURFACE WARFARE OFFICERS (FIRST LIEUTENANT ERIKAN ABUNAZ, FIRST LIEUTENANT BÜLENT TOBRUN, TURKISH AIR FORCE. 2012)

A 2012 study conducted by First Lieutenant Erikan Abunaz and Bülent Tobrun of the Turkish Air Force, as a part of their NPS master's thesis, examined the effect of Advanced Education on the promotion and retention of SWOs. The study classified Advanced Education as First Professional degrees or postgraduate education.

The data used was obtained from the Navy Econometric Modeling System, and it was composed of 73,347 data observations of 14,442 officers for the period of 2001–2011. The Abunaz and Tobrun (2012) study used a multivariate probit model to estimate the effects of education, prior service, accession source, and demographic variables on retention at 10 years of service, and on promotion to O-4. To measure performance, the study measured the promotion rate to O-4 of officers in the 10th year of service. (Abunaz & Tobrun, 2012).

The Abunaz and Torun (2012) study showed that Advanced Education did have an impact for retention and promotion of SWOs. A SWO holding a master's degree is 27.8 percentage points more likely to retain than one with a Bachelor's degree (Abunaz & Tobrun, 2012). Similarly, SWOs with master degrees are more likely to promote to O-4 than a SWO that held only a Bachelor's. Their results also showed that SWOs who had

First Professional degrees or doctorates were less likely to retain and less likely to promote than bachelor's degree holders.

This thesis will add to the 2012 study by bringing additional insight to the understanding of the effect graduate education has on the SWO community.

D. AN ANALYSIS OF THE IMPACT OF FULLY FUNDED GRADUATE EDUCATION ON THE RETENTION OF NAVAL OFFICERS

In 1999, LT Eric Conzen conducted a study, as a part of his NPS master's thesis, which investigated the effect of participation in fully funded graduate education on naval officers. He noted that significant thesis work at NPS up to that point had determined that graduate education played a significant role in retaining naval officers of various communities up to YCS 10 (Conzen, 1999). However, he sought to analyze the impact of fully funded graduate education on retention past YCS 10, in order to provide a better understanding of the greater ROI the Navy experiences (Conzen, 1999).

The data for the Conzen (1999) study was obtained from the Officer Master Personnel File database located in Monterey at the Defense Manpower Data Center (DMDC). During data cleaning he sought to isolate those who were in a position to make a voluntary decision to leave the Navy as such, due to service obligation pay grades O-1 and O-2 were largely removed, leaving a data set composed of pay grades O-3 through O-6, individuals who were under obligation for additional education were removed, and individuals separated for involuntary reasons were removed. Originally composed of 55,648 officers across all communities, following six different commissioning cohort groups across 1992–1998, the dataset was reduced to 34,310. Using a logit regression analysis approach, the Conzen (1999) study estimated the probabilities that a Naval Officer would voluntarily leave the service post education obligations having received fully funded graduate education from the Navy.

The findings of the Conzen (1999) study show some effect of a graduate degree the likelihood of promotion, but it found no effects on retention.

Through his analysis, the effect of graduate education on the retention of Naval Officers past the obligated service lengths was weak to non-existent. However, he does

state that a substantially smaller proportion of individuals who receive funded graduate education leave the Navy in comparison to those who funded their own graduate education or have only a bachelor's degree (Conzen, 1999). He admits that "it is extremely difficult to model human behavior for a single individual" and that it is hard to delineate exactly why an individual leaves the Navy or to necessarily identify the personal career aspirations or motives for an individual (Conzen, 1999).

E. HOW THIS STUDY DIFFERS

This study differs from the previous studies in that it seeks to examine the significance of graduate education timing within the SWO community and its effect on retention and job performance. Job performance is measured as promotion to O 4.

This study uses a bivariate probit approach to examine the effect of graduate education timing has on the retention. The discussion within the conclusion includes the potential impacts of the four new career track initiatives with relation to the effect of graduate education.

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IV. DATA

This chapter presents the dataset used in the analysis, and detailed descriptive statistics on key variables.

The data used in this thesis is obtained from Navy Bureau of Personnel (BUPERS) and the DMDC. It originally comprised data on 3,759 individuals holding the officer designators 1165 or 1160 at the time of commissioning during FY 1999 through 2003, followed annually until 2013, or until separation. The Navy's FY ends on September 30 and begins on October 1.

It is not possible with this data to differentiate SWO JOs that commission with lateral transfer options from those that do not. Similarly, there is no means to identify SWOs entering as nuke options. This analysis treats all individuals of this dataset as traditional SWOs. The dataset does not include adequate information to differentiate voluntary separations from involuntary separations and as such only measures raw separation.

The intent of this study is to understand the effect of graduate education within the SWO community. Therefore, individuals lacking a complete university history were removed from the dataset. After removing these individuals, the population to be analyzed was finalized to 3,148 officers. Individual regression models further discriminate the populations analyzed. The program used for analysis and observation of this dataset is STATA v 13.1.

The dataset contains a comprehensive list of longitudinal histories that cover qualitative and quantitative variables and attributes. These variables are used as either independent variables within analysis models, or for deriving new independent variables specific to this study. Independent variables included by the original dataset are: date of entry, date of separation, university history, gender and ethnicity identifiers, marital status, and dependent history. Service specific information include: designator history, Additional Qualification Designator (AQD) history, pay grade history, and commissioning source. While not imported into the final STATA, retention flows from

the SWO community manager (See Appendix) and assignment history were also available.

Independent variables created from this dataset were generated for the purposes of isolating and identifying specific milestones and career events, and providing summary statistics. Variables were created to identify lateral transfer history and ascension to DH. Additionally, variables to describe the education history were created to provide additional information about the larger population.

A. DEPENDENT VARIABLES

The objective of this research is to determine the effect of graduate education on an individual SWO JO retention outcome to remain within the Navy, within the SWO community, and promotion to O-4. Two dependent variables are used to measure the effect of graduate education within the population: retention, and promotion to O-4.

1. Retention

The ten-year mark is used for measuring retention. It is chosen due to the dataset's period of observation. Every individual in the data set has an observation as to whether they retained or not at the ten-year mark. When a longer period is chosen, responses are not available from the more junior cohorts as those individuals did not have adequate time to get to that advanced career mark. With this in mind, additional eleven and twelve year retention variables are created to capture retention effects for the more senior cohorts. For those receiving Navy sponsored graduate education, ten-year retention is a significant milestone because it approximately coincides with the terminus of the obligated service period. Whether they meet and exceed this milestone is an indication of graduate education's effect on retention.

Retention variables are binary variables, and are described and defined in Table 1.

Table 1. Retention variable defined

Variable Label	Range
10YR	=1 if the individual retains to the 10 years; 0 if otherwise
11YR	=1 if the individual retains to the eleven years; 0 if otherwise
12YR	=1 if the individual retains to twelve years; 0 if otherwise

2. Promoted to O-4

To assess the validity that graduate education is a glass ceiling for promotion to O-4 and beyond, promotion to O-4 is chosen as a dependent, or outcome, variable.

Promotion to O-4 outcome within the dataset is identified with the binary variable of *Promoted_O4*. Determining an individual's promotion to O-4 comes from pay grade history. When individuals are identified as having pay grade "O04" within the *Pay_grade_9*, *Pay_grade_10*, or *Pay_grade_11* variables, they were coded as having promoted to O-4, 0 if otherwise. The label and definition of the *Promoted_O4* variable is in Table 2.

Table 2. Promoted to O-4 variable defined

Variable Label	Range
Promoted_O4	=1 if individual promotes to O-4; 0 if otherwise

B. INDEPENDENT VARIABLES

The independent variables utilized in this study's analysis are presented in this subsection.

1. Demographics

This section includes a description of variables and traits related to the demographic characteristics of the SWOs in the data set used.

a. Cohorts

Individuals are assigned to a cohort based upon the fiscal year in which they were commissioned. FY99 is the comparison group for the final models.

A disparity exists of 1,312 individuals from the final dataset and the inventory provided by the SWO community manager. The community manager inventory by cohort is found in Table 3. For comparison, initial cohort inventory, before cleaning, is in Table 4, and the final working inventory, by cohort, is presented in Table 5. The disparities between the dataset inventory and PERS-41 inventory are uncertain but most likely attributed to an error in dataset compilation from BUPERS and DMDC.

Table 3. PERS-41 cohort inventory

COHORT Inventory from PERS-41	
Cohort FY 1999	850
Cohort FY 2000	960
Cohort FY 2001	906
Cohort FY 2002	897
Cohort FY 2003	847
Total:	4460

Obtained from PERS-41 pinpoints, see the Appendix.

Table 4. Original dataset inventory

Original COHORT Inventory			
	OBS	Count	Perc(%)
Cohort FY 1999	3759	650	17.29%
Cohort FY 2000	3759	674	17.93%
Cohort FY 2001	3759	738	19.63%
Cohort FY 2002	3759	865	23.01%
Cohort FY 2003	3759	832	22.13%

Table 5. Dataset inventory

COHORT Inventory			
	OBS	Count	Perc(%)
Cohort FY 1999	3148	522	16.58%
Cohort FY 2000	3148	536	17.03%
Cohort FY 2001	3148	587	18.65%
Cohort FY 2002	3148	754	23.95%
Cohort FY 2003	3148	749	23.79%

b. Race

The dataset groups officers into five race/ethnicity groups: White-Non Hispanic, Black-Non Hispanic, Hispanic, Asian, and Other or Unknown Ethnicity. Table 6 provides the distribution by race, showing their count and percentage of the sample population.

The White group represents the in majority the dataset, with Blacks being the second largest group. Due to this sizeable population, it was chosen to address the dichotomous nature of race within the dataset by a separate variable identifying individuals as non-White. The variable for non-White is defined in Table 7.

Table 6. Population by ethnicity

Ethnic Background			
	OBS	Count	Perc (%)
White-Non Hispanic	3148	2236	71.03%
Black- Non Hispanic	3148	356	11.31%
Hispanic	3148	293	9.31%
Asian	3148	159	5.05%
Other / Unknown Ethnicity	3148	104	3.30%

Table 7. Non-White defined

Variable Label	Range
Non_White	=1 if non-White; 0 if otherwise

c. Gender

The dataset is composed of both men and women. Unsurprisingly, the composition is largely male. Gender is included as an independent variable because of its significance in previous retention studies. The population by gender is described in Table 8. The variable for gender is labeled and defined in Table 9.

Table 8. Population by gender

Gender			
	OBS	Count	Perc(%)
Male	3148	2390	75.92%
Female	3148	758	24.08%
Non-Recorded	3148	2	0.06%

Table 9. Gender variable defined

Variable Label	Range
Female	=1 if female; 0 if otherwise

d. Marriage

Marital status was used in previous studies of SWO retention and is included within this study (Abunaz & Tobrun, 2012). Three binary variables were defined for this study: married at commissioning (yes or no), married at three years, and married at six years. The variable label and definitions are found in Table 10.

Table 10. Marriage variables defined

Variable Label	Range
Married	=1 if married at entry; 0 if otherwise
Married_3	=1 if married at three years of service; 0 if otherwise
Married_6	=1 if married at 6 years of service; 0 if otherwise

e. Dependents

Individuals having dependents are identified by the variable Dependents. The variable label and definition for the dependents variable is found in Table 11.

Table 11. Dependent variable label and definition.

Variable Label	Range
Dependents	=1 if an individual has dependents; 0 if otherwise

2. Education

Characteristics related to the education level of the dataset are included in the data set.

Earning a graduate degree is recorded in the university history of each individual officer. Roughly half of the officers of the original population in the dataset have earned a graduate degree at some point during the time horizon captured in the dataset. The number of individuals who earned a graduate degree is shown in Table 12.

Table 12. Graduate degrees within original population

Graduate Education			
	OBS	Count	Perc(%)
Graduate Degree	3148	1,403	44.57%
Non-Grad Degree	3148	1,745	55.43%

The dataset complete university history includes: school name, level attained, and Navy sponsorship level, as defined by volume two of the Navy Officer Occupational Classification System (NOOCS) and dates completed (DON, 2015).

A university level value of 6 establishes a Bachelor's degree. First Professional degrees or 18 hours or more of graduate study or a graduate degree from an unaccredited university are identified by a level value of 7 (DON, 2015). Values of 8 identify attainment of a master's degree. Individuals were categorized as having earned a master's degree if a value of 8 existed within their university history (DON, 2015). Those earning two or more master's degrees are identified if the value appears twice or more. Variable definition for those having two or more master's degree is found in Table 13.

Table 13. Two or more master's degrees defined

Variable Label	Range
TwoMasters	=1 if two or more master's; 0 if otherwise

This study is concerned with the timing of earning a graduate degree: prior to entry, during the first five years, between five and 10 years, and after the first 10 years of service. The timing is the difference, in months, from entry date to date of education completion. Individuals whose master's degree completion date was less than or equal to 60 months from entry were said to have completed within five years, they were said to have completed a master's degree between their five and 10 year mark if the difference was greater or equal to 60 but less than 120 months, and after their 10 year mark if it was greater than 120 months. Additionally, individuals who had master's degrees before entering were identified by a negative difference between master's degree completion and their entry date. Variable labels and definitions are found in Table 14.

Table 14. Master's degree attainment variables defined

Variable Label	Range
PriorMasters	=1 if earned a master's prior to entry; 0 if otherwise
Masters5	=1 if earned a master's degree within first 5 yrs; 0 if otherwise
MastersPlus5	=1 if earned a master's degree between 5 and 10 yrs; 0 if otherwise
MastersPlus10	=1 if earned a master's degree after first 10 yrs; 0 if otherwise

Navy programs to incentivize earning a graduate degree are prevalent within the dataset and a majority of those who earned a degree did so from a DOD institution or received monetary assistance from the Navy. Within university history, those individuals which had corresponding codes of A, V, G, N S, B, L or C within the sponsor attribute were coded as having received a Navy sponsored graduate degree (DON, 2015). These codes correspond to IGEP, VGEP, GEV, NPS, Olmstead or other scholarships, Burke Program, Law Education Programs, and Career Development Program (DON, 2015). Variable definition for those who received a Navy-sponsored degree is found in Table 15. Identification variables for those who participated in early graduate education programs are listed in Table 16 as well as the participant numbers in Table 17.

Table 15. Navy-sponsored graduate education defined

Variable Label	Range
NavSpon	=1 if Navy sponsored graduate degrees; 0 if otherwise

Table 16. Early Navy graduate education variables defined

Variable Label	Range
IGEP	=1 if the officer participated in IGEP; 0 if otherwise
VGEP	=1 if the officer participated in VGEP; 0 if otherwise
Scholarship	=1 if the officer participated in Olmstead or other DoD sponsored scholarships; 0 if otherwise

Table 17. Participation in early Navy graduate education programs

Participation in Early Grad Ed	
IGEP	34
VGEP	9
Navy Scholarship	17

A distribution of how individuals earned a graduate degree is found in Table 18.

A distribution of those earning degrees from a DOD school is provided in Table 19.

Table 18. Graduate education by source

Graduate Source			
	OBS	Count	Perc(%)
DoD	1403	767	54.67%
Civilian Institutions	1403	636	45.33%

Table 19. Distribution of DOD schools by type

DOD Graduate Schools			
	OBS	Count	Perc(%)
NPS	790	576	72.91%
NWC	790	180	22.78%
NDU	790	4	0.51%
Air University	790	17	2.15%
JMILINTEL	790	3	0.38%
NPS-No Master's	790	23	2.91%

Individuals are considered to have attended a DOD graduate school if the university attended for their master's degree was identified as Monterey, the Naval War College, US Air Force Air University, National Defense University (NDU), or Joint Military Intelligence School (JMILINTEL). The number of degrees awarded from DOD schools outnumber the number of students because within this dataset there are some individuals who hold two or more master's degrees. Of the 157 individuals who earned a second master's degree, 115 of those earned at least one from a DOD institution. Additionally, of the 803 DOD graduate students, 23 attended NPS and were not awarded a master's degree. These 23 individuals are not reflected in the DOD graduate degree holders.

3. Service Descriptors

This subsection contains information related to the total population of the dataset and their service statistics, namely, those who remained within the SWO community as defined by serving as a DH, those who remained within the Navy but laterally transferred from their community, and commissioning sources. Additionally, an amplified description of Navy designation and AQD systems are included to provide necessary understanding to their relevant importance in identifying those who laterally transferred.

a. Navy Officer Designators

Every Naval Officer has a four-digit designator that identifies their professional community. The designators for URL communities typically begin with the first primary digit of 1 whereas the RL communities begin with something other than a one. The complete four-digit code provides information as to an officer's community position, warfare qualification status, and duty status. As an example, a non-qualified SWO who is active duty and in training is designated with the designator 1160, one who is within the reserves with 1165. Once qualified, the designators change to 1110 or 1115 respectively. The dataset is composed of individuals who commissioned with the designator 1160 or 1165. Designators are often written in a three-digit manner when activity status is not necessary such as 111X for a SWO. Guidance for officer designators comes from part 'A' of the Manual of Navy Officer Manpower and Personnel Classifications, Vol. I (DON, 2015).

b. Additional Qualification Designation

The Navy utilizes a system of codes to identify advanced qualifications within the community trade skills. These codes are useful to quickly identify the necessary skills necessary for billeting. An example is the AQD LA9 which is awarded once a SWO JO has fully qualified as a Surface Warfare Officer. Every officer qualified as a SWO should hold this AQD within their AQD history. AQD guidance comes from part 'D' of NOOCS, Vol I (DON, 2015).

c. Department Heads

In order to isolate those who remained within the community, it was necessary to determine those who served as a DH. It is possible to use DH as an identifier for longevity within the community because it is a natural progression of the career track. SWO JOs wishing to remain within the Navy must either remain within the SWO community or laterally transfer. That said, it is difficult to identify those who serve as DHs because the Navy does not have a discrete identifier within the AQD history in the same manner as identifying a qualified SWO.

In order to define those who had served as a DH the variable *DH* was created from abstract data. DHs were identified by having the AQD, LF6 or LF7 for the Tactical Action Officer (TAO) qualification, which is typically stood by a DH. Individuals were coded as a DH if they possessed either AQD. It is possible to earn this qualification and not be a DH, however it is unusual. To remove those who qualified as TAO but did not remain to serve a DH tour, the variable was defined further to exclude those with 84-months of service or less. 84-months was chosen as DH school convenes at typically no later than YCS 7.5 and DH tours typically take place between YCS 7 and 10. Due to several incomplete AQD histories, individuals who met the necessary months in service and lacked AQD history but also had the SWO designator of 111X in the designator code for their 7th YOS, were coded as *DH*. Variable definition for DHs and labels are listed in Table 20.

Table 20. Definition of DH variable

Variable Label	Range
DH	=1 if DH; 0 if otherwise

DHs were represented as a binary variable within the dataset as shown in Table 20. Of the 3,148 observations, 1139, or 36.1% of observations were identified as DH. This distribution is shown in Table 21. This figure for the distribution of DHs within this dataset is consistent with data obtained from the PERS-41 SWO community manager and is shown in Table 22.

Table 21. Population by DH

Population by DH			
	OBS	Count	Perc (%)
DH	3148	1139	36.18%

Table 22. PERS-41 DH Data

DH from PERS-41					
FY99	FY00	FY01	FY02	FY03	Total
262	281	306	271	247	1367

Table constructed from Sept 2015 community manager pinpoints, See the Appendix.

The difference between PERS-41 numbers and the dataset can be explained by the removal from the dataset of individuals who lacked university histories or by the lack of those individuals who did not commission as an 1160 or 1165.

d. Lateral Transfers

Approximately 16% of the dataset's population laterally transfers from the SWO community at some point during their career and is illustrated in Table 23. Within the dataset, there exist only two individuals who left the community and returned to serve as DHs. It is assumed that the two groups, DH and Lateral Transfers, are exclusive of the other. Their identification within the dataset illustrates two very different career options for a SWO JO. They can leave the Navy, remain within the SWO community, or laterally transfer.

Table 23. Lateral transfers as share of the population.

Lateral Transfers			
	OBS	Count	Perc(%)
Lateral Transfers	3148	566	17.98%

The lateral transfers were identified by observing changes in the individual's designator history. A preliminary observation was made of the first two digits of the initial year and compared against the first two digits of subsequent years. If the two did not correspond the individual was said to have laterally transferred. An example would be an individual who began their career as a SWO and qualified in their second year with the 1110 in designator and left join the Engineering Duty Officer (EDO) community in their fourth year or service. The EDO community has the initial training designator of 146X

and since the first two digits do not correspond they have been identified as having laterally transferred within the Navy.

Similarly, to capture individuals who had laterally transferred into other communities that shared the initial two digits of their designator, variables were created to observe the third digit of their designator. An example of this is a SWO officer who leaves to join the SEAL community. The training designator for SEAL is 1185 and since the third digits do not equal they are considered as having laterally transferred.

Variable labels and definition for lateral transfers is found in Table 24.

Table 24. Lateral transfer variables define

Variable Label	Range
Lat_Transfer	=1 if lateral tranferred during period of observation; 0 if otherwise
Lat_Transfer_3	=1 if latteral transfer by YCS3; 0 if otherwise
Lat_Transfer_4	=1 if latteral transfer by YCS4; 0 if otherwise
Lat_Transfer_5	=1 if latteral transfer by YCS5 0 if otherwise
Lat_Transfer_6	=1 if latteral transfer by YCS 6; 0 if otherwise
Lat_Transfer_7	=1 if latteral transfer by YCS 7; 0 if otherwise
Lat_Transfer_8	=1 if latteral transfer by YCS 8; 0 if otherwise
Lat_Transfer_9	=1 if latteral transfer by YCS 9; 0 if otherwise

The period when SWOs left the community was determined with this data. It was found that if a SWO would laterally transfer within the Navy it would take place most often after YCS 3 and before YCS 6. The reason for this is most likely due to the policies limiting lateral transfers to those who have qualified within their commissioning communities and a period of service no less than 24 months without a waiver (DON,

2005). There is another pronounced increase in the number of lateral transfers near YCS 8 and 9 post-DH period. It is reasoned that these individuals chose to leave the community due to inability to screen for XO or had no further desire to remain within the community.

A distribution of which communities received SWO lateral transfers is found in Table 25. Of the lateral transfer population there are several individuals who cannot be identified or accurately assigned to a community. This is believed to be caused by a double count of Intel community officers and METOC officers. Prior to 2010 individuals who would fall into today's Intel community were spread across various designators with the base designation of 16XX and have since been re-designated as members of the Information Dominance Community, colloquially referred to as the Intel community, sharing the base 18XX designator with METOC officers. These two communities may be skewed slightly because of this (DON, 2010).

Table 25. Lateral transfers by community

SWO Lateral Transfer by Community			
	OBS	Count	Perc(%)
EDO (14XX)	566	126	22.26%
SEAL (113X)	566	10	1.77%
EOD (114X)	566	18	3.18%
Aviation (13XX)	566	34	6.01%
Human Resources (12XX)	566	96	16.96%
Supply (31XX)	566	18	3.18%
Intelligence (16XX) *	566	170	30.04%
METOC (18XX)	566	41	7.24%
MSC (230X)	566	6	1.06%
Construction Bat. (51XX)	566	21	3.71%
JAG Corps (25XX)	566	11	1.94%
Foreign Area (17XX)	566	7	1.24%
Medical Corps (21XX)	566	2	0.35%
Other/Unaccounted	566	6	1.06%

* Intel community switched from base "16XX" to base "18XX" in 2010.

e. Commissioning Source

The dataset is dominated by individuals who received their commission from ROTC, seconded by Officer Candidate School (OCS), and trailed by the Naval Academy. The distribution of commissioning source is shown in Table 26. The variable descriptions are found within Table 27.

Table 26. Dataset population by commissioning source

Commissioning Source			
	OBS	Count	Perc(%)
ROTC	3148	1,548	49.17%
Naval Academy	3148	697	22.14%
OCS	3148	839	26.65%
Unknown/Other	3148	64	2.03%

Table 27. Commissioning source variables defined

Variable Label	Range
ROTC	=1 if the commissioned through ROTC; 0 if otherwise
Naval_Academy	=1 if the individual commissioned through the Naval Academy; 0 if otherwise
OCS	=1 if the individual commissioned through OCS, 0 if otherwise

f. Prior Service

Whether or not an individual had prior enlisted service may have an effect on their tenure as a commissioned officer. Individuals who were prior enlisted for a significant portion of their careers may not remain to 10 years as they become eligible for retirement earlier than others within their cohort. Alternatively, someone who has prior service may be driven to perform and remain longer or promote higher than their peers. The variable label and definition for prior enlisted service is provided in Table 28.

Table 28. Prior enlisted service variable defined

Variable Label	Range
PriorE	=1 if prior enlisted service; 0 if otherwise

V. METHODOLOGY AND RESULTS

This chapter presents the final multivariate analysis models and the summary statistics utilized in answering this theses' premise of how the period in which graduate education is received affects the retention of SWOs. Promotion to O-4 is also tested to address concerns to the validity of a perceived notion that a graduate degree is needed to advance to O-4 or higher. The results of these models, as well as summary statistics, are used to infer possible implications of altering the community career progression.

A. MODELS

Differential bi-variate probit analysis was the method chosen to measure the effects of the independent variables on the dependent variables across three separate inclusive populations. All variables included within the model are binary, equal to 1 if a response is affirmative, and 0, if the response is negative. Within STATA there exists an option for probit and differential probit regression to isolate populations as defined by the user. This option was used in order to isolate populations for analysis.

1. Basic Retention Model

The basic retention model is listed in Figure 5. Subsequent retention models are altered slightly to isolate groups of individuals within the original population and modify independent variables specific to that period of observation. The dependent variable is a binary variable that takes a value of 1 if the officer retains, and 0 if an officer separates. The independent variables contain demographic characteristics including gender, race/ethnicity category, marital status, dependents. Job related measures included are prior enlisted, commissioning source. Education variables are earning a master's degree prior to service, after entry date but before five years of service, after five years of service but before ten, and after 10 years of service. Individuals who earn two or more master's degrees are also controlled. Variables for the individual FY cohorts are accounted to account for any not-observed factors that are particular to each cohort that might affect the decision to remain in the Navy or to separate such as demand for billets variation across years, private sector job opportunities.

Figure 5. Basic Retention Model

$$\begin{aligned} & \text{Will an officer remain in the Navy to XX year of service} = \\ & \beta_0 + \beta_1 \text{Cohort_FY00} + \beta_2 \text{Cohort_FY01} + \beta_3 \text{Cohort_FY02} + \beta_4 \text{Cohort_FY03} + \beta_5 \text{Masters5} + \\ & \beta_6 \text{TwoMasters} + \beta_7 \text{MastersPlus5} + \beta_8 \text{Married} + \beta_9 \text{Dependents} + \beta_{10} \text{Non_White} + \\ & \beta_{11} \text{Naval_Academy} + \beta_{12} \text{ROTC} + \beta_{13} \text{PriorE} + \mu \end{aligned}$$

2. Basic Promotion Model

The basic promotion model is shown in Figure 6. The model is used to test the validity of the perception that graduated education is needed for continued upward movement inside the SWO community. The model is altered when conditioning for a certain population is required. The dependent variable is a binary variable that takes a value of 1 if the officer promotes to O-4, and 0 if the officer does not promote to O-4, among those eligible for promotion and remaining after YCS 8. The independent variables contain demographic characteristics including gender, race/ethnicity category, marital status, dependents. Job related measures included are prior enlisted, commissioning source. . Education variables are earning a master's degree prior to service, after entry date but before five years of service, after five years of service but before ten, and after 10 years of service. Individuals who earn two or more master's degrees are also controlled. Individuals who earn two or more master's degrees are also controlled. Variables for the individual FY cohorts are accounted to account for any not-observed factors that are particular to each cohort that might affect the decision to remain in the Navy or to separate such as demand for billets variation across years, private sector job opportunities.

Figure 6. Basic Promotion Model

$$\begin{aligned} & \text{Promote to O-4} = \\ & \beta_0 + \beta_1 \text{PriorMasters} + \beta_2 \text{Masters5} + \beta_3 \text{MastersPlus5} + \beta_4 \text{MastersPlus10} + \\ & \beta_5 \text{TwoMasters} + \beta_6 \text{Cohort_FY00} + \beta_7 \text{Cohort_FY01} + \beta_8 \text{Cohort_FY02} + \beta_9 \text{Cohort_FY03} + \\ & \beta_{10} \text{Dependents} + \beta_{11} \text{Married_6} + \beta_{12} \text{Female} + \beta_{13} \text{PriorE} + \beta_{14} \text{Naval_Academy} + \beta_{15} \text{ROTC} + \\ & \beta_{16} \text{NavSpon} + \beta_{17} \text{DH} + \mu \end{aligned}$$

B. PERIOD OF GRADUATION EDUCATION ATTAINMENT

Three distinct periods occur within the dataset for earning a graduate degree after commissioning, before the fifth year of service, between year five and ten, and after 10 years of service. Overwhelmingly, the period between five and 10 years of service shows the highest number of degrees attained. The number of graduate degrees earned during each period relative to the dataset's original populations is shown in Table 29 including a breakdown by period and DH attainment. Similarly, graduate education attainment for the population after YCS 8 is found in Table 30. The histogram of university level one variable showing most recent education earned by an individual conditioned to graduate education is found in Figure 7, illustrating the relative popularity of when master's degree are earned.

Table 29. Graduation attainment within original population

Graduate Degree Attainment			
	OBS	Count	Perc(%)
Grad Ed	3148	1403	44.57%
No Grad Ed	3148	1745	55.43%
Master's By Cohort			
Cohort_FY99	522	285	54.60%
Cohort_FY100	536	243	45.34%
Cohort_FY101	587	276	47.02%
Cohort_FY102	754	314	41.64%
Cohort_FY103	749	285	38.05%
Master's Awarded			
Prior Master's	1403	19	1.35%
Master's <5	1403	197	14.04%
Master's 5-10	1403	1019	72.63%
Master's >10	1403	294	20.96%
Department Heads			
DH w/Grad Ed	1139	859	75.42%
DH w/PriorMasters	1139	10	0.88%
DH w/ Master's<5	1139	65	5.71%
DH w/ Master's 5-10	1139	697	61.19%
DH w/ Master's >10	1139	161	14.69%

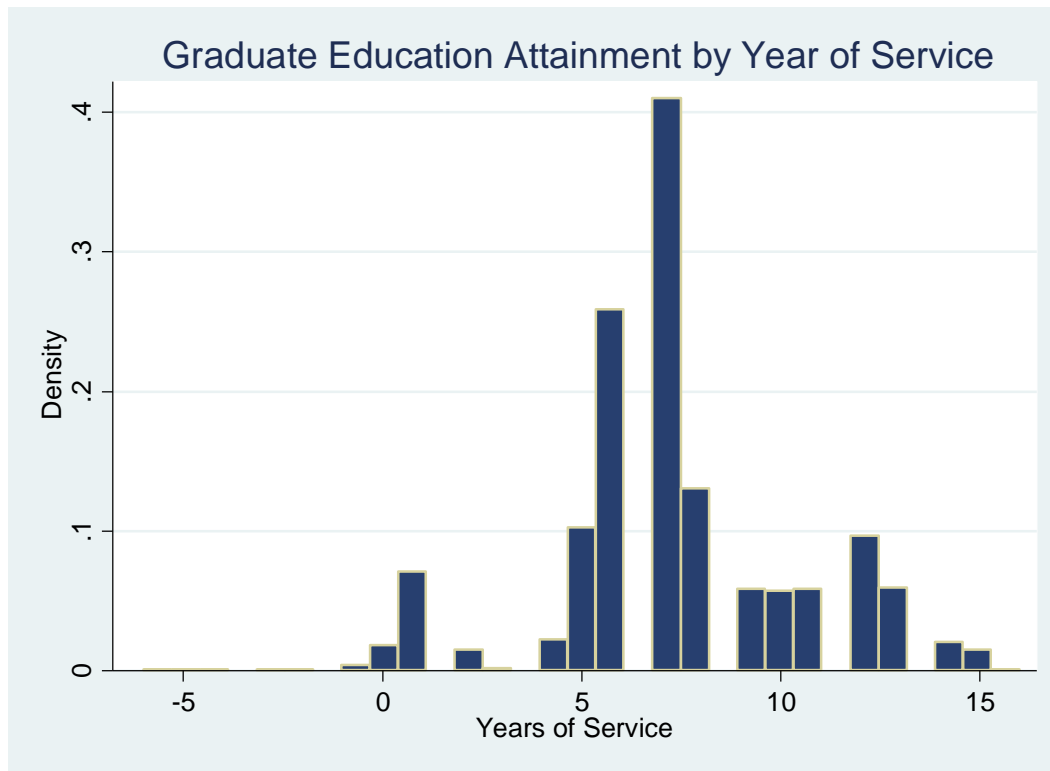
Table 30. Graduation attainment within population after YCS 8

Graduate Degree Attainment			
	OBS	Count	Perc(%)
Grad Ed	1667	1260	75.58%
No Grad Ed	1667	407	24.42%
Master's By Cohort:			
Cohort_FY99	319	264	82.76%
Cohort_FY100	301	232	77.08%
Cohort_FY101	325	246	75.69%
Cohort_FY102	361	272	75.35%
Cohort_FY103	361	246	68.14%
Master's Awarded			
Prior Master's	1260	13	1.03%
Master's< 5	1260	119	9.44%
Master's 5-10	1260	972	77.14%
Master's>10	1260	269	21.35%
Department Heads			
DH w/Grad Ed	1096	849	77.46%
DH w/Prior Master's	1096	10	0.91%
DH w/ Master's<5	1096	59	5.38%
DH w/ Master's 5-10	1096	693	63.23%
DH w/ Master's >10	1096	160	14.60%

The dataset has a high concentration of individuals with master's degrees with 44% of the original population having earned graduate education. Of those who remain past YCS 8, 75% earn a master's degree. If we were to compare the population after YCS 8 to other occupational statistics from the Bureau of Labor statistics, the only occupational field that has a higher percentage of their workforce aged 25 or older with graduate education are speech language pathologists at 84%, with the next closest being librarians at 55% (BLS, 2015). Comparatively, the percentage of master's degrees across all occupational fields aged 25 or older, as defined by the BLS, is 9% (BLS, 2015).

This high percentage of master's degrees within the population attainment makes individuals not having a master's degree the minority. It can be inferred from the large number of attained master's degrees that earning one is an expected milestone.

Figure 7. Graduate education attainment by YOS



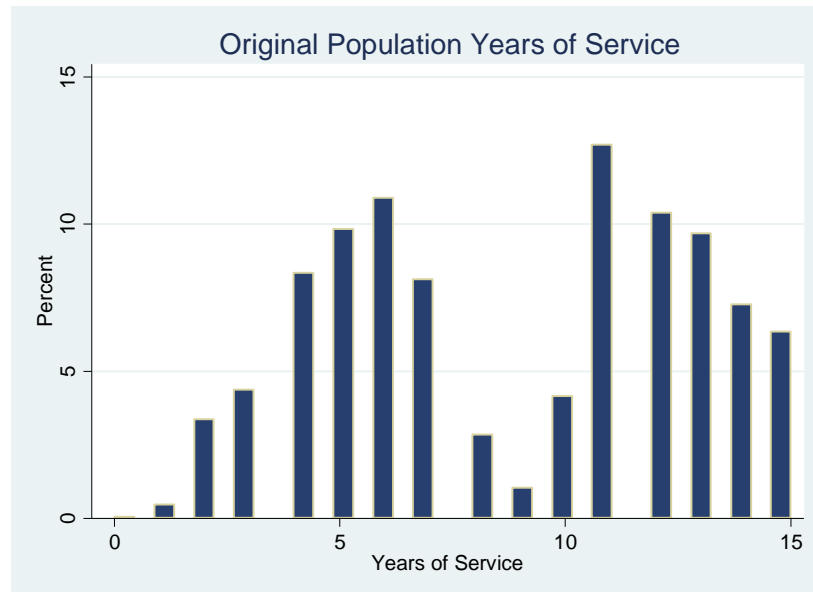
C. RETENTION

Retention is measured at different time marks by different models, conditioned to three separate populations of the dataset: those who remain past eight years of service, those who remain within the SWO community as a DH, and the original population. These groups are tested separately to determine the effect of the original SWO JOs and of the effect education has on retaining SWOs through DH and later.

There are two distinct periods that see an increased level in separations from the Navy, after YCS 5 and again at after YCS 10. The distribution of years of service of individuals from the original population is shown in Figure 8. Individuals remaining at

the end of the dataset are included in this figure. Members from Cohort FY03 should be expected to be recorded as 10 years of service, FY02 11 years, etc.

Figure 8. Original population Years of Service.



These trends are explained by the obligatory service periods dictated by various programs. The period after YCS 5 is caused by expiration of initial obligation. The period after YCS10 is most likely due to the expiration of additional obligations incurred by the individual, either graduate education, or other as mandated by their communities. If a SWO uses graduate education and is required to sign RJCSRB, YCS 10 approximately coincides with completing required DH tours. It is because of this obligation that retention to the eleventh and twelfth year is tested with the available individuals.

Added flows showing the numbers remaining within each cohort by the end of the FY recorded until the end of the dataset is shown in Table 31. The percent who remain until the end of data collection is provided in at the bottom.

Table 31. Retention flows by cohort

Flows by Cohort					
YCS	Cohort FY 99	Cohort FY 00	Cohort FY 01	Cohort FY 02	Cohort FY 03
0	522	535	587	753	749
1	521	530	585	753	742
2	516	527	583	733	666
3	508	514	560	654	651
4	468	456	496	608	596
5	424	411	458	532	489
6	375	356	387	446	407
7	324	309	337	374	371
8	306	295	314	353	357
9	296	287	311	348	350
10	282	273	294	327	285
11	270	254	279	258	
12	258	242	234		
13	249	180			
14	200				
End %	38.31%	33.64%	39.86%	34.26%	38.05%

1. Ten-Year Retention

The objective of this model is to determine the effect of the timing at which individuals earn their master's degrees and the effect on retention to the tenth year of service. The model is ran across three different populations of the dataset, the original population of the dataset since date of commissioning observed referred to as population A and observed in column A of Table 33, the individuals remaining after YCS 8, referred to as population B and observed in column B of Table 33, and the DH population, referred to as population C and observed in column C.

Variables for the model are listed in Table 32. The effect of graduate education on retention is expected to be positive due to the obligations associated with Navy sponsored participation. Population A is included for the purposes of comparison and control and is expected to have greatly higher coefficients due to the attrition experienced between YCS

5 and 6 and is not the best estimate of the effect of graduate education on retention. To observe explicitly the effect of graduate education on the 10 year retention, population B is estimated isolating the population of the original dataset who remain to YCS 8 attempting to mitigate for the mass attrition at the end of initial obligated service. To observe the effect on the DH population model C.

Results of Ten-year retention model are found in Table 33. The estimated coefficients of a probit model indicates the statistical significance and sign of the effect of each explanatory variable, while the marginal effects reveal the size of the effect of the explanatory variables on the accession probability. Table 33 presents the marginal effects, with standard errors included in parentheses and statistical significance indicated by the asterisks. The marginal effects are interpreted in comparison with the left out, comparison group

Table 32. Ten-year retention variables and comparison groups

Variable Label	Comparison Group
Cohort_FY00-03	Compared against Cohort_FY99
PriorMasters	Compared against those who never earned a master's degree or earned one outside of this period
Masters5	Compared against those who never earned a master's degree
MastersPlus5	Compared against those who never earned a master's degree
TwoMasters	Compared against those who never earned a master's or those who only earned one
Married_6	Compared against those who were not married at YCS 6.
Dependents	Compared against those who did not have dependents.
Non_White	Compared against individuals who identify as White.
Naval_Academy	Compared against OCS.
ROTC	Compared against OCS.
PriorE	Compared against those without prior service
DH	Compared against those who left the SWO community or those who left the Navy.

Table 33. Ten-year retention marginal effects

10 year Retention			
	A	B	C
VARIABLES	YR10	YR10	YR10
PriorMasters	0.146	---	---
	(0.153)	---	---
Master's5	-0.0595	-0.0553*	-0.0425
	(0.0513)	(0.0323)	(0.0296)
MastersPlus5	0.347***	0.0334***	0.0622***
	(0.0287)	(0.0124)	(0.0159)
TwoMasters	0.215***	---	0.0252***
	(0.0662)	---	(0.00936)
Cohort_FY00	0.00644	0.0109	0.0126
	(0.0464)	(0.0131)	(0.0113)
Cohort_FY01	0.0465	0.0327***	0.0232**
	(0.0454)	(0.00984)	(0.00901)
Cohort_FY02	0.0301	0.0369***	0.0245***
	(0.0433)	(0.00952)	(0.00928)
Cohort_FY03	-0.245*	0.0430**	-0.940***
	(0.148)	(0.0178)	(0.0236)
Dependents	-0.0223*	-0.00852*	-0.00938**
	(0.0132)	(0.00453)	(0.00377)
Married_6	0.385***	0.0219**	0.0196**
	(0.0230)	(0.0110)	(0.00989)
Female	-0.0509*	-0.0256*	-0.0127
	(0.0308)	(0.0156)	(0.0135)
PriorE	0.317***	0.0143	0.298***
	(0.114)	(0.0262)	(0.0297)
Naval_Academy	-0.330***	-0.155***	-0.161***
	(0.0421)	(0.0414)	(0.0457)
ROTC	-0.302***	-0.0609***	-0.0562***
	(0.0320)	(0.0158)	(0.0151)
Non_White	0.0918***	0.00567	0.00403
	(0.0275)	(0.00968)	(0.00831)
NavSpon	0.323***	0.0279**	0.0250**
	(0.0289)	(0.0110)	(0.0104)
DH	0.507***	0.0135	---
	(0.0200)	(0.0106)	---
Observations	3,148	1,507	1,129
Standard errors in parentheses			
*** p<0.01, ** p<0.05, * p<0.1			

--- denotes no use due to collinearity or perfect success

a. Education

Across all three populations, having a prior master's degree does not have a statistically significant impact on retention to 10 years, compared with retention for those who did not have a master's degree. Within populations B and C, *PriorMasters* predicted success perfectly and were dropped from the analysis either because they had left the service or they were controlled for by another variable.

Earning a master's degree before five years shows no statistical benefit to retention across any of the populations, as compared with the retention of those who had not earned a master's degree. Within population B there is a slight negative effect on retention from having a master degree before the fifth year (p-value < 0.1). Based upon the coefficient, individuals within population B who earned a degree before five years of service are 5% less likely to remain than those who did not earn a master's degree. Ultimately, earning a degree in this period is not vastly important to the population compared to other variables.

As expected, the *MastersPlus5* variable shows a positive effect on retention across all three populations with the coefficient varying in its size upon the population. That suggests that those with a master degree earned during the five to 10 year period are more likely to retain than those who did not earn a master's degree. The vast majority of individuals within this dataset earn their degrees during this period and the additional service requirement is still a factor for those who remain, particularly within the DH population, as the DH tour obligation would be on the verge of completion.

Those earning two or more master's degrees are significantly more likely to remain to 10 years. This is most likely attributable to an individual using Navy sponsored graduate education to earn their second degree and is artificially higher.

b. Demographics

Across the cohorts, FY01 and FY02 show statistically positive effects on retention. This is potentially due to patriotic fervor experienced after the September 11 terrorist attacks and escalation of operation for Operation Enduring Freedom and Operation Iraqi Freedom that appealed to individual's sense of duty and remain within

the Navy. Within the DH population, this significance and positive effect is supported by numbers from the SWO community manager (PERS-41, 2015). The community was 11% over their DH quota for YG01. Similarly, Cohort FY03 is statistically less likely to remain with the coefficient being absurdly high within the DH population. This high coefficient brings into question if there are factors affecting the cohorts, which are not controlled for, within this dataset. Despite the high coefficient, SWO community manager retention numbers support the downturn of DH retainers and YG01 fell short of their quota by 12%. This negative coefficient could be the result of increased operational tempos affecting the wellbeing of SWO JOs and dissuading them from remaining within the community.

Individuals who are married at YCS 6 are more likely to remain than those who are not married, while those with dependents show negative effects toward retention compared with those with no dependents. However, p-values place the level of significance at 90%. Non-whites are more likely to retain than whites within population A, and while the coefficients express positive effect in populations B and C, their p-values render them not statistically significant.

Women are less likely than men to retain within populations A and B; however, within the DH population, the coefficient is not statistically significant. This lack of significance is most likely due to other contributing factors associated with DH retention to 10 years.

c. Service Descriptors

Not surprisingly, prior enlisted service shows a positive effect on the retention to 10 years. This is because 10-year retention within this data is defined as 10 years since commissioning and the YCS 10 for someone with prior enlisted service could potentially be quite close to their eligibility to retirement. Those who have enlisted service have already remained long enough that there is not a net benefit to leaving the service before 10 years. Those DHs who have prior enlisted service are almost 30% more likely to remain to 10 years than their counterparts who do not.

Naval Academy and ROTC graduates are more likely to leave the service than their OCS counterparts and are statistically significant in all three observed populations.

2. Eleven-Year Retention

The 11-year retention model is included because 11 years is the first realistic period that someone who had used Navy sponsored graduate education and served as a DH would be able to leave. The 11-year model is similar to the basic and 10-year models with the exception that *Cohort_FY03* is not included within the observable population and the variable *MastersPlus10* is included. *Cohort_FY03* is not included due to the junior nature of the variable and incomplete service history to YCS11. *MastersPlus10* is included to control for individuals who are earning degrees immediately after the YCS 10 period and in previous iterations model without *MastersPlus10*, the variable *TwoMasters* was overinflated.

The objective of this model is to determine the effect of the timing when individuals earn their master's degrees has on retention to the eleventh year of service. The populations remain segregated in the same manner described within the 10-year retention model. Independent variable and comparison groups are labeled in Table 34. Model results are found in Table 35.

Table 34. Eleven-year retention variables and comparison groups

Variable Label	Comparison Group
Cohort_FY00-02	Compared against Cohort_FY99; FY03 not included.
Masters5	Compared against those who never earned a master's degree
MastersPlus5	Compared against those who never earned a master's degree
MastersPlus10	Compared against those who never earned a master's degree
TwoMasters	Compared against those who never earned a master's or those who only earned one
Married_6	Compared against those who were not married at YCS 6.
Dependents	Compared against those who did not have dependents.
Non_White	Compared against individuals who identify as White.
Naval_Academy	Compared against OCS.
ROTC	Compared against OCS.
PriorE	Compared against those without prior service
DH	Compared against those who left the SWO community or those who left the Navy.

Table 35. Eleven-year retention marginal effects

Eleven Year Retention			
	A	B	C
VARIABLES	YR11	YR11	YR11
PriorMasters	0.130	0.0529	---
	(0.156)	(0.0432)	---
Master's5	0.0890	0.0146	-0.0178
	(0.0598)	(0.0290)	(0.0501)
MastersPlus5	0.416***	0.0982***	0.159***
	(0.0329)	(0.0231)	(0.0335)
Master'sPlus10	0.494***	0.143***	0.137***
	(0.0278)	(0.0127)	(0.0162)
TwoMasters	-0.0492	0.0253	0.0207
	(0.0821)	(0.0352)	(0.0576)
Cohort_FY00	0.0183	0.0245	0.0112
	(0.0460)	(0.0211)	(0.0313)
Cohort_FY01	0.0528	0.0392**	0.0451*
	(0.0458)	(0.0200)	(0.0271)
Cohort_FY02	0.00673	0.0258	0.0333
	(0.0436)	(0.0204)	(0.0276)
Dependents	-0.0150	-0.00431	-0.0125
	(0.0142)	(0.00696)	(0.00904)
Married_6	0.313***	0.0229	0.0432*
	(0.0279)	(0.0170)	(0.0224)
Female	-0.0208	-0.0210	0.00846
	(0.0347)	(0.0218)	(0.0265)
PriorE	0.138	0.0245	0.0137
	(0.0982)	(0.0328)	(0.0517)
Naval_Academy	-0.148***	-0.0457	-0.161***
	(0.0468)	(0.0323)	(0.0578)
ROTC	-0.175***	-0.0309	-0.0763***
	(0.0343)	(0.0188)	(0.0269)
Non_White	0.0395	-0.00937	-0.0278
	(0.0312)	(0.0164)	(0.0225)
NavSpon	0.189***	0.0273	0.0358
	(0.0384)	(0.0183)	(0.0240)
DH	0.437***	0.0420**	---
	(0.0259)	(0.0175)	---
Observations	2,399	1,306	872
Standard errors in parentheses			
*** p<0.01, ** p<0.05, * p<0.1			

--- denotes no use due to collinearity or perfect success

a. Education

Across all three populations *PriorMasters* is not statically significant, and within the DH population, shows perfect success and therefore is dropped from STATA's regression. The reason for the insignificance is most likely due to other controlling factors.

Earning a master's degree within the five- and ten-year period still shows a very strong effect on the likelihood of retention. The possibility that an individual has an obligation still exists but is less likely than at 10-year retention. Within the DH population, based upon coefficients *MastersPlus5* shows a 15% higher likelihood than someone who does not have a master's degree. *MastersPlus10* has a positive effect of 13.7% higher likelihood of retaining to the eleventh year than someone who does not have a master's degree. The popular mode for DHs to earn a graduate degree after their DH tour is the NWC and within the dataset we observe that 161 DHs earn their master's degree after YCS 10, and of those 113 were earned from a DOD School which incurs additional service. It is due to this sizeable portion of individuals that *MastersPlus10* show such a strong significance. See Table 36 for visual representation. *TwoMasters* is not significant in retention to the eleventh year.

Table 36. *MastersPlus10* and *DH* if *DOD_School*=1

MasterPlus10	DH		Total
	0	1	
0	227	366	593
1	84	113	197
Total	311	479	790

b. Demographics

Cohort_FY01 continues to show a positive effect compared to FY99 but is diminished in the coefficients magnitude and p-values reduce within all populations with it being insignificant in population A. Compared with FY99 the remaining cohorts are insignificant relation to retention.

Racial and gender variables become insignificant to 11-year retention. Dataset diversity might be the cause for this insignificance as other variables have greater influence over the populations.

Marriage and dependents lessen their effect on retention. Marriage at YCS 6 still displays a positive effect on retention to 11 years in population A and the DH population. The reason for the effect of marriage on retention to the eleventh year is potentially due to the necessity for the financial stability provided. Individual that are married are less likely to make sweeping life changes such as restarting their career.

c. Service Descriptors

Naval Academy and ROTC graduates continue be less likely to retain within populations A and C compared to their OCS counterparts. Prior enlisted is no longer statistically significant with respect to retention to the eleventh year. This is most likely due to other factors not controlled for within the mod2el that have an effect on career progression after 10 years. As the cohorts become more senior the initial differences which set individuals apart with unique skills, abilities, and experiences are mitigated or altered by experiences and progression within the career field.

3. Twelve-Year Retention

The 12-year model is included as a comparison of the continued progression of the senior cohorts compared to the dataset as a whole. Due to the junior nature of Cohorts FY03 and FY02 they are not included in the observed populations. The reduced size of the populations is not as diverse and less robust as if it included additional numbers. The model used is unaltered from the 11-year retention model with the exception of *Cohort_FY02*.

The objective of this model is to determine the effect of the timing when an individual earns a master's degree has on retention to the eleventh year of service. The populations remain segregated in the same manner described within the 11-year retention model. Independent variable and comparison groups are labeled in Table 37. Model results are found in Table 38.

Table 37. Twelfth year retention variables and comparison groups

Variable Label	Comparison Group
Cohort_FY00-02	Compared against Cohort_FY99; FY03 not included.
Masters5	Compared against those who never earned a master's degree
MastersPlus5	Compared against those who never earned a master's degree
MastersPlus10	Compared against those who never earned a master's degree
TwoMasters	Compared against those who never earned a master's or those who only earned one
Married_6	Compared against those who were not married at YCS 6.
Dependents	Compared against those who did not have dependents.
Non_White	Compared against individuals who identify as White.
Naval_Academy	Compared against OCS.
ROTC	Compared against OCS.
PriorE	Compared against those without prior service
DH	Compared against those who left the SWO community or those who left the Navy.

Table 38. Twelve-year retention marginal effects

Twelve Year Retention			
	A	B	C
VARIABLES	YR12	YR12	YR12
PriorMasters	0.129 (0.181)	0.0891** (0.0412)	0.0988 (0.101)
Masters5	0.0506 (0.0762)	-0.0363 (0.0542)	-0.0937 (0.104)
MastersPlus5	0.398*** (0.0390)	0.121*** (0.0309)	0.223*** (0.0475)
MastersPlus10	0.533*** (0.0296)	0.204*** (0.0179)	0.222*** (0.0215)
TwoMasters	-0.00145 (0.0977)	0.0601 (0.0414)	--- ---
Cohort_FY00	-0.0255 (0.0441)	-0.000429 (0.0275)	0.00239 (0.0453)
Cohort_FY01	0.0367 (0.0445)	0.0402 (0.0260)	0.0572 (0.0437)
Dependents	-0.00299 (0.0158)	0.00127 (0.00935)	-0.00135 (0.0151)
Married_6	0.276*** (0.0327)	0.00117 (0.0222)	0.0291 (0.0353)
Female	-0.0164 (0.0412)	-0.0189 (0.0299)	0.0655 (0.0411)
PriorE	0.0440 (0.0866)	-0.00467 (0.0450)	-0.0309 (0.0788)
Naval_Academy	-0.105* (0.0636)	-0.0530 (0.0516)	-0.212** (0.103)
ROTC	-0.101*** (0.0382)	0.00562 (0.0230)	-0.0435 (0.0386)
Non_White	0.0615* (0.0357)	-0.00218 (0.0218)	-0.0351 (0.0369)
NavSpon	0.147*** (0.0436)	0.0270 (0.0245)	0.0511 (0.0377)
DH	0.369*** (0.0316)	0.0269 (0.0224)	--- ---
Observations	1,645	945	553
Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1			

--- denotes no use due to collinearity or perfect success

a. Education

Within population B, those with a master's degree before commissioning are 9% more likely to retain to 12 years than someone who did not have a master's degree. Within populations A and C, *PriorMasters* is not statistically significant in terms of retention to 12 years. The cause for the significance of the *PriorMasters* variable within population B is unknown.

Based upon coefficients of *MastersPlus5*, within the DH population, those who earned a master's degree during the fifth and tenth year of service are 22% more likely to retain to the twelfth year than those who had not earned a master's degree. This positive effect exists across all three observed populations. Similarly *MastersPlus10* has an equally large effect on retention to the twelfth year within the DH population. The positive effect on the retention is most likely due to the overwhelmingly large portion of the population remaining at YCS 12 who has graduate education. Of population B, 783 individuals remain to YCS 12 and of those, 84% or 654 earned a master's degree at some point in their career. Again, a majority of those who earned a master's degree after 10 years of service did so at a DOD institution which holds with it an extended service obligation inflating the *MastersPlus10* variable.

Having two or more master's degrees within populations A and B is insignificant to the retention to 12 years. Within the DH population, the variable *TwoMasters* is dropped during analysis by STATA because all individuals with two or more master's degrees retain to the twelfth year. Whether the degree is Navy sponsored is not significant to 12-year retention within populations B or C but has a positive effect on population A that is statistically significant.

b. Demographics

Again, as the cohorts become smaller with age the definitive characteristics which individuals have when they commissioned become less significant because those who remain to the twelfth year have other mitigating factors that affect the reasons for retaining. With this in mind, marriage, dependents and gender all become insignificant across population B and C. Only in population A, does marriage at the sixth year have a

statistically significant positive effect on retention to the twelfth year. Considering populations B and C are conditioned to measure the populations from YCS 8 to YCS 12 it is more likely that marriage at the sixth year plays more of positive effect on retention to the eighth year than the twelfth year. Only within population A is race shown to be statistically significant to retention showing an increased likelihood of retention to the twelfth year if an individual is non-White compared to White.

Within the cohorts, FY01 shows a slight positive effect on the retention, which is consistent throughout the previous two retention models however, neither FY01 nor FY00 are considered statistically significant to retention to the twelfth year.

c. Service Descriptors

Naval Academy and ROTC graduates continue to be less likely to retain than their OCS counterparts but the coefficient is only significant within population A. An exception to this is a 21% likelihood that Naval Academy graduates would be less likely to retain than their OCS counterparts within the DH population (p-value < 0.95).

As with the 11-year retention model, prior enlistment does not show a statistically significant effect on retention to the twelfth year within any of the populations.

4. Retention Summary

The period which an individual receives graduate education is statistically significant across all three observed populations observing for 10-, 11-, and 12-year retention. The coefficients and effect varies with depending upon the period of retention tested. The cause of this positive effect may not be deliberate because of the education itself, but rather the obligation incurred when assistance is received from the Navy. Naturally, the later someone earns affects this window of obligation.

Demographically, cohort FY01 generally has a higher effect on retention than the others due to reasons, which cannot be explicitly explained or controlled. Racial and gender factors are only statistically significant within certain populations but once conditioned in other populations it is overcome by other independent variables. Similarly,

marriage at six years has a greater effect population A but a lesser effect in B or C due to conditioning of the observed population from YCS 8 to retention year tested.

ROTC and Naval Academy graduate generally have a lower probability to retain than their OCS counterparts.

D. PROMOTED TO O-4

The first opportunity to earn O-4 is at YCS 9 and, as such, the populations are conditioned in the same manner as the retention models with population A being the original population, B the population remaining at YCS 8, and C those individuals who remain within the SWO community as DHs.

The objective of this model is to measure the effect the timing of graduate education has on the promotion to O-4. By measuring this effect we can test the validity to the perception that having a master's degree is an unwritten requirement for promotion to O-4 and beyond. The belief that a master's degree is an unspoken requirement for O-4 is prevalent and might be the driving incentive for an individual to earn a master's degree.

For prospective, the numbers of those who promoted to O-4 from the original population are found in Table 40 and remaining past minimum service requirement to YCS 8 is provided in Table 39. Independent variables and comparison groups are found in Table 41. Promotion Model results are listed in Table 41.

Table 39. Promotion to O-4 if remaining at YCS 8

Promoted O-4			
	OBS	Count	Perc(%)
Promoted	1667	1227	73.61%
Did Not Promote	1667	440	26.39%
Promoted By Cohort:			
Cohort_FY99	319	252	79.00%
Cohort_FY100	301	255	84.72%
Cohort_FY101	325	272	83.69%

Promoted O-4			
Cohort_FY102	361	264	73.13%
Cohort_FY103	361	184	50.97%
Master's Recipient			
Overall O-4	1227	1027	83.70%
Prior Masters	13	11	84.62%
Masters <5	119	91	76.47%
Masters 5-10	972	772	79.42%
Masters >10	269	257	95.54%
DH to O-4			
Overall	1139	820	71.99%
DH w/Grad Ed	859	690	80.33%
DH w/Prior Masters	10	9	90.00%
DH w/ Masters<5	65	44	67.69%
DH w/ Masters 5-10	697	552	79.20%
DH w/ Masters >10	161	154	95.65%

Table 40. Promoted to O-4 original population

Promoted O-4			
	OBS	Count	Perc(%)
Promoted	3148	1242	39.45%
Did Not Promote	3148	1906	60.55%
Promoted By Cohort:			
Cohort_FY99	522	252	48.28%
Cohort_FY00	536	255	47.57%
Cohort_FY01	587	272	46.34%
Cohort_FY02	754	264	35.01%
Cohort_FY03	749	185	24.70%
Master's Recipient			
Prior Masters	19	11	57.89%
Masters <5	197	91	46.19%
Masters 5-10	1019	772	75.76%
Masters >10	294	257	87.41%

Figure 9. Promotion to O-4 independent variables and control groups

Variable Label	Comparison Group
Cohort_FY00-03	Compared against Cohort_FY99
PriorMasters	Compared against those who never earned a master's degree
Masters5	Compared against those who never earned a master's degree
MastersPlus5	Compared against those who never earned a master's degree
TwoMasters	Compared against those who never earned a master's or those who only earned one
Married_6	Compared against those who were not married at YCS 6.
Dependents	Compared against those who did not have dependents.
Non_White	Compared against individuals who identify as White.
Naval_Academy	Compared against OCS.
ROTC	Compared against OCS.
PriorE	Compared against those without prior service
DH	Compared against those who left the SWO community or those who left the Navy.

Table 41. Promoted to O-4 marginal effects

Promoted to O-4			
	A	B	C
VARIABLES	Promoted_O4	Promoted_O4	Promoted_O4
PriorMasters	-0.0616 (0.121)	-0.0372 (0.145)	0.101 (0.122)
Masters5	0.259*** (0.0467)	0.136*** (0.0270)	0.103** (0.0432)
MastersPlus5	0.368*** (0.0293)	0.174*** (0.0287)	0.249*** (0.0371)

Promoted to O-4			
MastersPlus10	0.580***	0.260***	0.270***
	(0.0300)	(0.0167)	(0.0201)
TwoMasters	-0.00356	0.00878	-0.0395
	(0.0600)	(0.0510)	(0.0780)
Cohort_FY00	0.0481	0.0591*	0.0293
	(0.0415)	(0.0354)	(0.0511)
Cohort_FY01	0.0869**	0.0952***	0.0981**
	(0.0420)	(0.0326)	(0.0441)
Cohort_FY02	-0.0175	0.00109	-0.0470
	(0.0375)	(0.0367)	(0.0516)
Cohort_FY03	-0.207***	-0.184**	-0.219**
	(0.0642)	(0.0767)	(0.101)
Dependents	-0.0246**	-0.0196**	-0.0267**
	(0.0106)	(0.00963)	(0.0119)
Married_6	0.304***	0.129***	0.123***
	(0.0228)	(0.0246)	(0.0304)
Female	0.00326	0.0195	0.0504
	(0.0276)	(0.0276)	(0.0348)
PriorE	0.0505	-0.00182	-0.0362
	(0.0823)	(0.0649)	(0.0912)
Naval_Academy	-0.177***	-0.131***	-0.171***
	(0.0305)	(0.0408)	(0.0525)
ROTC	-0.187***	-0.101***	-0.155***
	(0.0261)	(0.0265)	(0.0335)
Non_White	0.0114	-0.0294	-0.0722**
	(0.0244)	(0.0235)	(0.0307)
NavSpon	0.142***	0.0562**	0.0106
	(0.0297)	(0.0245)	(0.0316)
DH	0.295***	0.0362	---
	(0.0241)	(0.0236)	---
Observations	3,148	1,667	1,139
Standard errors in parentheses			
*** p<0.01, ** p<0.05, * p<0.1			

--- denotes collinearity or perfect success

a. Education

With the large population of master's degree holders within all populations it is not surprising to see such large coefficients. It can be inferred by the large number of graduate degrees that individuals felt that obtaining a master's degree was the next logical professional step whether they remained within the Navy or not.

Much like earning a bachelor's degree, earning a master's degree takes time, dedication and discipline. It is not surprising to see that it is statistically significant that those who earn a master's degree within the first five years are more likely to promote to O-4 across all populations compared to someone who did not earn a master's degree. Within DH population, 90% of the individuals who earned a master's degree before the fifth year of service promote to O-4.

Those earning degrees between YCS 5 and YCS 10 are also significantly more likely to promote to O-4 than those who do not earn a master's degree across all populations. Similarly, those who earn a master's degree after YCS 10 are statistically more likely to have promoted to O-4 than someone who did not have a master's degree.

Having a second master's degree or a master's degree prior to entering the service is not shown to be statistically relevant to promotion to O-4 in any of the populations. Additionally, with the exception of population A, Navy sponsored education is not significant to promotion to O-4. It would appear that after YCS 8 it does not matter where the master's was awarded but rather whether an individual had one or not.

b. Demographics

Gender is not statistically significant to selection to O-4, although having dependents is. Across all three populations having a dependent decreases an individual's promotion to O-4 by as much as 2.6% in the DH population compared to someone who does not have dependents. The reason for this decreased likelihood is unknown and can only be explained by unknown variables without control in the dataset. Unexpectedly, while there is a significant negative effect on promotion to having dependents, marriage at six years has a very pronounced and statistically significant positive effect on promotion within all three populations.

Within populations B and C, race is not significant to promotion. Within the DH population however, a non-white individual is 7% less likely to promote to O-4 than a white individual. Of the individual Cohorts, FY01 and FY03 are more likely to promote to O-4 than FY99.

c. Service Descriptors

Graduates of ROTC and the Naval Academy experience statistically negative effects across all three populations in comparison to their OCS counterparts. These negative coefficients suggest that within this dataset, officers commissioning from the Naval Academy and ROTC are less likely to promote to O-4 than an individual from OCS.

Coefficients for those prior enlisted individuals are not significant in promotion to O-4. Within the population A, DHs are 36% more likely to promote to O-4 compared to non DHs. This is however misleading as the vast majority of the original population has left the dataset by YCS 8, causing inflation of coefficients.

1. Promoted to O-4 Summary

Promotion to O-4 is 73% across the dataset for individuals who make it to YCS 8 with 84% of those individuals having earned a master's degree at some point during their careers. With the data available, it can be inferred that earning a master's degree at any point during their career makes an individual more likely to promote to O-4 than someone who does not hold a master's degree. The vast number of master's degrees at the O-4 level supports the casual observation that earning a master's degree is considered the next professional step in a SWO's career.

E. CHAPTER SUMMARY

This chapter presented the bivariate probit analysis models used to evaluate the effects of graduate education on the retention to the tenth, eleventh, and twelfth year of service within the dataset across three inclusive populations. It also presented the bivariate probit analysis model used to evaluate the effect of graduate education on the promotion to O-4 across these same populations. The effect of graduate education and the

timing when it is earned is shown in both models to be positive with respect to retention and promotion. Additional information derived from the dataset illustrates the popular periods for individuals to earn their master's degree as well as the expected trend of separation across all five cohorts.

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VI. SUMMARY, CONCLUSION, AND RECOMMENDATIONS

A. SUMMARY

This thesis examined the effects of timing of graduate education attainment on retention and promotion outcomes across five fiscal year entry cohorts of the SWO community.

The data used for this study was obtained from the BUPERS and DMDC. It was comprised of data on approximately 3,148 SWOs who commissioned between fiscal year 1999 and 2003 with data reported annually until 2013, or until separation. The purpose was to examine the effects which the period of earning a master's degree affected the retention of SWOs and use these results to determine the role graduate education affects the decision of SWO JOs to remain within the community.

Probit regression analysis was conducted across three different populations of the available dataset: total population from YCS 0, individuals remaining at YCS 8, and those identified as having remained within the SWO community through DH. The analysis controlled for the timing of attainment of a master's degree, Navy sponsorship of education, commissioning year, source of commission, prior enlisted service, as well as marital status at YCS 6, dependent status, race, and gender.

Regression analysis supports the increased likelihood of retention based upon earning a degree within period of the fifth and tenth year, and after the tenth year. Retention effects of graduate education after the tenth year to the eleventh and twelfth years are misleading due to the number of DOD sponsored degrees award during this period and subsequent obligatory required service.

Additional regression analysis was done to test the validity of a popularly perceived notion that graduate education is considered necessary to advance within the Navy. Differential bivariate probit analysis was the method of choice and was tested across the same three populations as retention with similar controlling variables. The analysis concluded that across all populations examined that earning a master's degree improved the likelihood of promotion to O-4 over someone who did not have a master's

degree. Analysis of the summary statistics of those who remained to YCS 8 shows that of the 73.6% who promoted to O-4, 83.7% earned a master's degree at some point during the dataset, with 79.4% of the degrees earned between the fifth and tenth year, prior to the period for selection to O-4. It was determined that of those who earned a master's degree after their tenth year, 95% were promoted to O-4. The DH population data showed that, 72% promoted to O-4 with 80% of that promoted population having earned a master's degree, while 67% of the DH population promoting to O-4 earned a degree within the fifth to tenth year. The summary statistics of along with regression analysis supports some the claim that a graduate degree is required for upward movement.

B. CONCLUSION AND RECOMMENDATIONS

1. What effect does graduate education have in the SWO community with respect to retention and promotion?

a. Conclusion

With 75% of the DH population having earned a master's degree it can be assumed that earning a master's degree is important to the SWO community. Although the necessary data to determine direct causality was lacking in this dataset, the large number of master's degrees indicates that graduate education is a factor in their decision to stay within the SWO community. Additionally, the large saturation of master's degrees suggests that a DH is expected to have a master's degree as not having a master's degree places an individual within the minority.

DHs earning a master's degree, no matter the period within their career, are more likely to promote to O-4 and retain to the tenth, eleventh and twelfth year of service as opposed to someone who has never earned a master's degree. This improved likelihood of promotion adds validity to the perceived notion of a master's degree as a requirement for upward mobility.

b. Recommendation

SURFOR and PERS-41 should maintain and expand their graduate incentive programs. Data suggests that programs in concert with RJCSRB allow the SWO

community to leverage graduate education in a manner to cause significant positive retention. However, it is suggested that SURFOR and PERS-41 analyze the manpower requirement for SWO subspecialty coded officers and billet graduate education quotas with the intent of fulfilling a utilization tour immediately following to improve overall ROI for the Navy.

2. Does the period when a SWO earns a graduate degree affect their decision to remain in the Navy and the SWO community?

a. Conclusion

The period in which a SWO earns a graduate degree does affect retention however, there is insufficient data to determine the causality of a SWO JO to leave the community or for a DH's departure from the community post sea tour. A DH earning a master's degree between their fifth and tenth year of service is 22% more likely to remain to the twelfth year than someone who did not have a master's degree. Attaining a master's degree after the tenth year of service also shows an increased likelihood of 22% in retention to the twelfth year. Those who earned a master's degree during the first five years of service showed no significant effect on retention to the tenth, eleventh or twelfth year of service.

Overwhelmingly, the period between the fifth and tenth is the most popular period for DHs to earn a graduate degree with 81% of all DH master's degrees earned during this period covering 63% of the overall DH population. There is also a sizeable population that choose to earn a master's degree after the tenth year of service with roughly 14% of the DH population earning a degree within this period. Individuals earning their degrees after 10 years are more likely to do so through DOD institutions and retaining due to additional obligated service.

b. Recommendation

It is recommended that SURFOR and PERS-41 continue to offer graduate incentives within shore periods to encourage SWO JOs to earn their graduate degrees. Policy should be written to support this trend. Policies which compete or dissuade an

individual from earning a master's degree during the shore tour potentially run the risk of losing positive retention effects provided by graduate education.

3. What foreseeable impact does altering the traditional SWO career track have on SWO graduate opportunities and retention?

a. Conclusion

The SWO community benefits from the numerous hard and soft skills of the graduate education process and leverages their positive in conjunction with RCJSRB to generate positive retention effect. Based upon the large number of master's degree within the DH population of this dataset and the popularity of the fifth to tenth year for master's degree attainment, it can be assumed that altering the career track would interfere with the shore period and potentially cause a loss in the positive retention effect accomplished by graduate education. The introduction of WTI and other competing interests could potentially decrease the positive effect of graduate education. However, other career track options which pair graduate education with immediate utilization tours can capitalize on the enormous demand signal for graduate education within the SWO community and improve the overall ROI for the SWO community and Navy. With the current career planning policies and the general positive opinion making graduate education attainment a continued priority within the SWO community, it is unlikely that the proposed career track option would cause a serious negative effect on either graduate education participation or overall retention.

b. Recommendations

It is recommended that PERS-41 and SURFOR should continue to support graduate education opportunities during the fifth and tenth year of service. A review of utilization billets and should be conducted and billets that could be filled by a subspecialty coded O-3 identified. SWO graduate education billets should be awarded based upon the ability to complete a utilization tour immediately following completion and before DH school sequencing.

C. FUTURE RESEARCH

This thesis began with the intention to identify causality between graduate education and SWO JO ascension to DH. Unfortunately, it was not possible to determine causality from the available data. PERS-4 and SURFOR should commission a study to identify SWO JOs eligible to become DHs using fitness report data to determine the factors to DH ascension. A study examining lateral transfer requests could support other causalities. Knowing the available options to an individual can help to determine the reasons why an individual leaves the community or the Navy. Without this, we can only infer and assume correlation based upon summary statistics and regression analysis. It would be of great benefit to the Navy to further study the causal effects of why an individual stays in a certain capacity.

Other areas related to this thesis to benefit the Navy and SWO community as future research topics, are listed below:

- Graduate education on the retention of SWOs to O-6 and beyond
- The necessity of graduate education within the SWO community
- Navy utilization process
- The viability of subspecialty utilization prior to DH school.
- Performance of SWO officers within utilization billets
- Lateral transfer of SWOs
- Utilization within the SWO community
- Performance of SWOs earning graduate degrees from DOD and Non-DOD sources
- The effect of graduate education and retention on the reserve and full time support SWO populations

-The potential selection bias associated with higher retention of those with graduate education attained after five years of commissioned service by SWOs that might be already committed to a Navy career

-The role of graduate education in the promotion to O-4 below zone, in zone, and above zone

-A study observing how the operational tempo and period of ship's life cycle during the initial DO tours affect their likelihood to ascend to DH

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RPN - (Not included in overall Pinpoint numbers)																													
SWQ(N)		YG94	YG95	YG96	YG97	YG98	YG99	YG00	YG01	YG02	YG03	YG04	YG05	YG06	YG07	YG08	YG09	YG10	YG11	YG12	YG13	YG14	YG15						
Remaining inventory minus pending losses		7	12	13	21	12	11	18	13	18	18	22	21	24	21	42	48	70	93	86	112	122	109						
SWQ(N) Contracts																			16	17	20	17	4	Included in RUCSRB takers					
FTS		YG94	YG95	YG96	YG97	YG98	YG99	YG00	YG01	YG02	YG03	YG04	YG05	YG06	YG07	YG08	YG09	YG10	YG11	YG12	YG13	YG14	YG15						
Current inventory		3	7	5	13	11	14	14	20	14	14	12	8	7	4	6	4	10	6	2	10	3							
FTS Contracts																			11	8	5	3	6	1					

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